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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

Region 1

14

WHITE PINE BLISTER RUST CONTROL

Calendar Year 1958

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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

REGION 1

P(BR)
REPORTS
Annual

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This report was prepared from information submitted by the several forests and under the direction of the Chief of the Division of State and Private Forestry in Region 1.

CONTENTS

WHITE PINE BLISTER RUST CONTROL - 1958

Forest Service

Region 1

P(BR)
SUPERVISION
Report, Region 1
Annual, 1958

WHITE PINE BLISTER RUST CONTROL

I. SUMMARY OF ALL BLISTER RUST CONTROL PROGRAMS

This report covers three control programs: National Forest, State and Private, and National Parks. Under cooperative agreements with the respective agencies, the U. S. Forest Service provides leadership and technical direction for all programs and performs such operational and project management services as requested by the cooperating agencies. Also reported are the principal developments in chemical methods and ribes ecology and in rust resistant white pine and equipment. A complete report on the use of Acti-dione in the treatment of western white pine blister rust is also included. The following agencies are conducting or actively cooperating in white pine blister rust control:

U. S. Forest Service
National Park Service
State of Idaho
Clearwater Timber Protective Association
Potlatch Timber Protective Association
Priest Lake Timber Protective Association
University of Idaho

Reorganization of Division of Blister Rust Control - Effective July 1, 1958, the Division of Blister Rust Control was discontinued. All functions and activities were assigned to the Division of State and Private Forestry. A section of Forest Insect and Disease Prevention and Control was established within the Division. Blister rust control was made a unit of the section. The Rust Resistant White Pine Production Project at Moscow, Idaho also is a unit of the section. Emil H. Juntunen is Division Chief with Homer J. Hartman chief of the section. Henry J. Viche heads the Blister Rust Control Unit and Richard T. Bingham is in charge of the Rust Resistant Unit. Virgil D. Moss directs the Blister Rust Control, Development and Improvement Unit and is stationed at the Inland Empire Research Center of the Intermountain Forest and Range Experiment Station, Spokane, Washington.

Herman E. Swanson retired October 31, 1958, and Frank O. Walters retired January 31, 1959. Mr. Swanson had been in blister rust control work for 31 years and Mr. Walters, 29 years. Both men were prominent among the pioneers of blister rust control work in the West. They made many technical and administrative contributions that are now in common use throughout the nation. Forests, people, and communities of the Inland Empire will long reap the benefits of their accomplishments.

Progress - Blister rust control crews in 1958 worked 82,890 acres, which is a slight decrease from 1957. The production of the crews increased

to an all-time high of .55 man-day per acre. The reduced acreage was due to (1) the region experienced an above-average fire season. As a result, BRC crews were on fire duty the greater part of August. Over 7,900 effective eradication man-days, or 15% of total man-days, were lost to fire and (2) the Acti-dione work reduced the number of men employed on ribes eradication. With over 1,600 man-days spent on this project, the acreage worked by ribes eradication crews was proportionally reduced.

A Region 1 Blister Rust Control Handbook has been drafted and is now being reproduced.

Acti-dione treatment of blister rust cankers - The effectiveness of Acti-dione in killing blister rust cankers has been so encouraging that all operations treated trees during the past season. Progress in the development of methods of application has resulted in the basal-stem method which has more than tripled production over exise and split methods. Over 290,000 trees on 1,770 acres were treated during the season. The treatment of these trees will result in a substantial increase in white pine yield per acre. Acti-dione and Phytoactin foliage spray formulations are being tested and results are very promising. Tests in immunizing white pine seedlings against blister rust infection are also being carried out. An expansion in the field application of Acti-dione will be made in 1959.

Acti-dione testing is being pushed aggressively to learn as quickly as possible the full potential of this and related fungicides and their impact on conventional control methods. Mr. Moss is being assigned a full-time research forester to assist in this work.

Northern Idaho Forest Genetics Center - The new Northern Idaho Forest Genetics Center in cooperation with the University of Idaho and the Intermountain Forest and Range Experiment Station, opened at Moscow, Idaho on September 22, 1958. A complement of three professional personnel, a nurseryman, and a secretary-technician staff the center. The physical plant includes forty-two acres of land (leased from the University of Idaho), office, laboratories, and greenhouse facilities. Work toward production of rust-resistant planting stock has been considerably strengthened. A seventeen-acre experimental seed orchard at Sandpoint, Idaho is being developed for 1960 planting with grafts of good parents. The new greenhouse facilities of the Center is now being used for the production of 3,000 grafts for the experimental seed orchard.

National Parks - The 13,570 acres worked in 1958 exceeds the acreage worked in any previous year. The initial work in Grand Teton National Park was completed, which is a year ahead of schedule.

Blister Rust Damage Survey in mature western white pine - Damage surveys were conducted over a large area on the Clearwater and St. Joe National Forests. The surveys were run to determine the life expectancy of the badly infected unprotected mature stands. The information is being used by the forests and the Division of Timber Management for the establishing of cutting schedules as to time and place and to determine access road priorities.

Field Meetings - A meeting of Blister Rust Control personnel of the region was held on the Coeur d'Alene National Forest in October 1958 for the purpose of inspecting control areas and discussing work procedures on the ground. Representatives of the regional office divisions of Fire Control, Timber Management, and personnel from the Intermountain Forest and Range Experiment Station and Inland Empire Research Center were in attendance. Discussion topics included relationship of control burns to blister rust work, partial cutting, and chemical application. These field meetings contribute to the proper coordination of timber management practices and plans with those of blister rust control.

Spread of the rust - No new infection locations were found in 1958 outside the known southern and southeastern limits of the rust. Considerable buildup of the rust was noted in Montana and Wyoming where previously reported.

1. Blister Rust Control Expenditures, Calendar Year 1958

State	U. S. Forest Service Region 1					National Park Service	State and Private	Totals
	720	042	411	K-V	Total			
Idaho	$140,753	$755,778	$ 89,594	$79,169	$1,065,294	$ --	$ 89,115	$1,154,409
Mont.	18,960	34,064	--	2,114	55,138	17,590	--	72,728
Wash.	11,136	189,682	--	9,617	210,435	--	--	210,435
Colo.	2,572	--	--	--	2,572	13,467	--	16,039
Wyo.	9,076	--	--	--	9,076	123,828	--	132,904
Total	$182,497	$979,524	$ 89,594	$90,900	$1,342,515	$154,885	$ 89,115	$1,586,515

720 - Leadership and technical direction for all programs
042 - National forest program
411 - Federal funds for State and Private Program
K-V - Stand improvement collections used for BRC on national forest lands

2. Field Organization, 1958

Program	Camps	Employees	Contractors
National Forest	29	790	18
National Park	8	118	--
State and Private	6	230	--
Totals	43	1,138	18

3. Ownership in Blister Rust Control Area

Program	National Forest Acres	National Park Acres	Public Domain Acres	State Acres	Private Acres	Total Acres
National Forest	814,160	--	3,070	24,950	72,330	914,510
National Park	--	52,960	--	--	--	52,960
Idaho State & Private	14,200	--	3,830	62,950	95,680	176,660
Totals	828,360	52,960	6,900	87,900	168,010	1,144,130

4. Total Progress on Ribes Eradication in 1958

Program	Working	Regular Work Acres	Checker Flanker Acres	Total Worked Acres	Man-days	Ribes	Per Acre	
							Man-days	Ribes
National Forest	Initial	4,870	--	4,870	7,180	1,493,000	1.47	307
	Rework	30,990	5,080	36,070	21,290	1,262,000	.59	35
	Maintenance	8,980	8,160	17,140	3,980	51,000	.23	3
	Totals	44,840	13,240	58,080	32,450	2,806,000	.56	48
National Parks	Initial	1,870	7,530	9,400	3,650	471,000	.39	50
	Rework	2,490	590	3,080	1,840	120,000	.60	39
	Maintenance	160	930	1,090	130	2,000	.12	2
	Totals	4,520	9,050	13,570	5,620	593,000	.41	44
State & Private	Initial	1,330	--	1,330	2,170	1,303,000	1.63	980
	Rework	4,700	450	5,150	4,650	70,000	.90	14
	Maintenance	1,210	3,550	4,760	1,050	16,000	.22	3
	Totals	7,240	4,000	11,240	7,870	1,389,000	.70	124
All Programs	Initial	8,070	7,530	15,600	13,000	3,267,000	.83	209
	Rework	38,180	6,120	44,300	27,780	1,452,000	.63	33
	Maintenance	10,350	12,640	22,990	5,160	69,000	.22	3
	Totals	56,600	26,290	82,890	45,940	4,788,000	.55	58

5. Chemical Eradication in 1958

Program	Acres	Man-days	Ribes	Gallons
National Forest	1,850	3,560	1,820,000	345,000
National Park	1,110	2,340	402,000	73,000
State and Private	250	410	1,080,000	51,000
Totals	3,210	6,310	3,302,000	469,000

6. Contract Ribes Eradication in 1958

Program	Number of Contracts	Acres	Man-days	Ribes	Dollars
National Forest	35	1,550	1,340	13,500	$20,331

7. Acres in Control Area

Program	Total	1941-1960	1921-1940	1881-1920	1841-1880	Before 1841
National Forest	914,510	40,590	187,920	277,950	52,110	355,940
State & Private	176,660	24,650	63,250	45,850	6,560	36,350
National Parks	52,960	- - -	- - - Not Classified - - - - -			- - - - -
Totals	1,144,130	65,240	251,170	323,800	58,670	392,290

8. Summary of Control Status

Program	Total Acres	Unworked Acres	Worked Areas		
			Needing Rework	Needing Re-Examination	On Maintenance
National Forest	914,510	229,860	131,680	244,610	308,360
National Park	52,960	15,530	3,090	5,620	28,720
State & Private	176,660	33,310	35,450	43,310	64,590
Totals	1,144,130	278,700	170,220	293,540	401,670

9. Acti-dione Work in 1958

Program	Acres	Man-days	Trees Treated
National Forest	1,680	1,630	277,300
State & Private	90	40	16,900
Totals	1,770	1,670	294,200

II. NATIONAL FOREST PROGRAM

Clearwater National Forest

The 1958 blister rust control program on the Clearwater National Forest was the largest in several years. This resulted in an increase in effective man-days despite a nine percent loss to blister rust caused by fire suppression activities. There was very little labor turnover although a considerable number of men left earlier than usual. Approximately forty percent of the crew had previous blister rust experience.

One Forest Service camp worked in Units 58 and 59, French Creek; one worked in Unit 18, Sylvan Creek and one worked in Unit 27, Swanson, Unit 60, Tepee and Unit 61, Sheep Mountain. A 10-man spray crew spent the season on stream-type and roadside spraying in Unit 47, Deception Creek. A 12-man crew worked the last part of the season in Unit 54, Musselshell. A 10-man crew was engaged in Acti-dione work in Units A-23 and A-27.

The crew working in French Creek completed the final coverage in the pole and young mature stands in this unit and started working in Unit 59. The crew working in Unit 18 completed the needed rework in the Sylvan plantation and progressed well into the pole stands. The crew working the Sheep Mountain area completed initial work in the protection zone around the new sale area and completed initial coverage in the Swanson-Deadhorse and Tepee Creek sale areas. The heavy stream-type on Deception Creek was given chemical treatment from the head nearly to the mouth, and the roadsides in the sale area adjoining this stream-type were also covered. A 12-man crew removed the ribes on the 1958 Deer Creek Plantation and on an area to be planted in the spring of 1959.

A ten-man crew of Forestry School students was engaged all field season in the application of Acti-dione to infected white pine trees. The two plantations in Alder Creek, comprising 210 acres, were given complete coverage. In addition, this crew started work in the Beaver Creek Plantation but this was not completed before the men had to return to school. Late-fall Acti-dione work was performed in the Powderhouse area.

Starting on September 17, a 5-man crew conducted a survey of blister rust damage of mature white pine on selected areas in the North Fork of the Clearwater River.

The program using K-V funds on blister rust control work was considerably more extensive than in any previous year. All work in Unit 47 in the Cedars area and in Unit 54, Musselshell was financed by these funds. In addition, practically all of the work accomplished in Units 27, 60 and 61 in the Sheep Mountain and Tepee areas was a part of the K-V program.

On all stabilized areas the ribes numbers are being reduced to maintenance standards. This applies to Unit 18, Sylvan and Units 58 and 59, French Creek, except for a small area of recent cutting at the head of Rosebud Creek. The remainder of the 1958 work was on areas recently disturbed by logging and the ribes population had not become stabilized. All needed work on these K-V areas is on schedule. A heavy wind storm in July necessitated making a salvage sale in the Swanson-Deadhorse area which will upset the original working schedule and another blowdown in November probably will further complicate the work schedule as originally established.

The greatly-accelerated cutting program of recent years on the Clearwater National Forest has placed a considerable strain on the adequacy of appropriated funds to do the necessary blister rust control work in these white pine management units. This is especially true in the older stands where planting will be necessary to secure the next crop of white pine. On these areas the available K-V funds will be required for planting work and very little will remain for blister rust control.

By Marvin C. Riley, Forester in Charge

Coeur d'Alene National Forest

Progress during June and July was exceptionally good due to favorable weather and high quality of seasonal labor. Frequent and prolonged interruptions for fire suppression from late July to mid-September reduced the overall accomplishments for the season to less than that of 1957. A total of 1,315 effective man-days were lost from project work exclusive of Sunday and holidays. Frequent and prolonged interruptions for fire fighting also seriously affected the efficiency and morale of crews when on project work.

Chemical eradication with power spray equipment was increased in 1958 and must be further expanded next year to keep the proper timing of eradication on the large prescribed burn areas in Potter, Yellow Dog and Burnt Cabin Creek units. Approximately 1,000 acres were controlled burned this fall in white pine units. Six truck-mounted power spray units were operated this year.

Approximately 17 percent of total effective man-days were financed from K-V funds this year, an increase of 5% over 1957. In addition to the six regular camps, a 5-man power spray crew worked out of the Shoshone Work Center during July and August on the Capital Hill area in the Dudley Creek Unit. This operation was financed from K-V funds. Other K-V work was done on the Steamboat and Burnt Cabin Units.

Eradication by contracting was discontinued in 1958 due to a lack of interest in this type of work. Revival of the contracting program may be possible in 1959 if the lack of job opportunities in private industry continues at the 1958 level. However, experienced BRC workers are reluctant to make the necessary investment in camp equipment, forfeit unemployment and social security benefits and gamble on possible higher earnings from contracting than received in force account work.

A six-man crew was employed during the 1958 season to eliminate killing cankers with Acti-dione from selected crop trees in reproduction and pole stands on the Deception Creek Experimental Forest and a 25-year-old plantation in the Brett Creek Unit. Approximately 20,000 trees were treated on 150 acres at a cost of 200 man-days.

Ribes populations were reduced to maintenance standards on 1,410 acres or 34 percent of the premaintenance area worked in 1958. The presently required work to place the West Elk Creek Unit on a maintenance basis was completed this year.

By Harry J. Faulkner, Forester in Charge

Kaniksu National Forest

The 1958 Blister Rust Control Program was one of the most successful in recent years. All of the objectives for the 1958 work plan were either fulfilled or exceeded. The main highlights of the year are as follows: (1) An improvement in the production percentage figure, (2) a greatly increased Acti-dione program, (3) a large pine disease and stocking survey, and (4) one of the largest contract programs since 1950.

The efficiency in eradication continued to improve. This year's figure of 0.44 man-day per acre topped last year's record of 0.46. The eradication program was administered in 28 control units. Eight camps, employing 210 men, were located in the Kaniksu National Forest, and a 30-man camp operated in the Colville National Forest. State and Private funds financed two 25-man camps.

The first large-scale Acti-dione program was initiated. Before the opening of camps, Acti-dione treatment was given to the Cuban Hill Plantation by a small crew of overhead personnel. In June, Virgil D. Moss, BRC Development and Improvement Unit, conducted an Acti-dione school for unit supervisors and camp superintendents who were to be engaged in such work. Following the school, a 10-man crew from the Upper Lamb Creek Camp spent the field season treating portions of the Upper Lamb and Bath Creek Plantations. Later in the season, a crewman from the Boswell Camp and two crewmen from the Pelke Camp contributed a total of 21 man-days on Acti-dione treatment. After the camps had closed, a 6-man crew resumed work in the Cuban Hill Plantation. The basal stem spray application was employed after the first of August, replacing the now obsolete method of slitting. Cost per tree was greatly reduced by the new method.

An extensive pine disease and stocking survey was conducted by experienced crews after the close of the regular field season. Survey information was gathered in five potential white pine units. Three of the units; Ten Mile, Smalle, and Winchester Creeks are in the Newport District; of the other two, Zero Creek is in the Priest Lake area and Grass Creek is in the Bonners Ferry region. In Zero Creek, an area of immature white pine, data also included blister rust damaged trees that could be saved with Acti-dione. A status check survey was also performed in the Zero Creek and the Rapid Lightning Drainages. Rapid Lightning is another potential addition to the present control program.

The 1958 contracting program was one of the largest since 1950. Twenty-four contract areas were completed by eighteen contractors. Enthusiasm of contractors was high, and indications are that next year's program will be even larger, as many contracts have been let this fall in preparation for work next spring.

In June, the 1958 work plans were enlarged because of an increase in funds made available July 1, 1958. Additional crewmen were employed and a new camp was constructed in the Tango Creek area. This camp was in operation the first week in July.

Chemical eradication was smaller than in the past several years; however, the man-day per acre has decreased indicating a more efficient application. A series of test plots were established in five different

spray areas. Information from these plots will be used to check more accurately the efficiency of the chemical operation.

Due to the extremely dry forest condition, a large number of man-days were spent on fire suppression. Fires fought were on the Kaniksu National Forest with the exception of two fires on State of Idaho lands and one fire each in the Kootenai and Colville National Forests. District and fire organization personnel were impressed by the fine performance of the blister rust fire suppression crews.

This spring, the Priest Lake and Falls Districts planted western white pine in several areas in the Reeder Mountain and Blickensderfer Units. These same districts, aided by BRC personnel, obtained a high degree of success this fall in the control burning of 300 acres inside blister rust control units.

Henry J. Viche was transferred to the regional office. Harold E. Andersen replaced Viche as BRC staff officer, and Quentin Larson was promoted to project officer. The two unit supervisors were Ted Golden and Robert Graham. Orval Gastineau was in charge of contracting, and Clem Wallace was the chemical supervisor.

By Harold E. Andersen, Forester in Charge
Quentin Larson, Project Officer

Kootenai National Forest

The 1958 control program was made up of three small camps of approximately twelve men each, including one power-spray crew. Spraying was started in an extensive area of salvage-logged beetle-damaged spruce adjacent to and above a white pine pole stand in the Spar Lake Unit. Some K-V money was expended. Future chemical workload is increasing due to salvage logging within the protective zones of white pine blister rust control units. Hand eradication work was done in Spar Lake, Star Creek and South Fork of Meadow Creek Units.

Planned accomplishments of the 1958 season were decreased 49% due to loss of effective man-days to fire suppression. Of the total 1840 effective man-days available, 900 were spent on fire control work.

Acti-dione treatment of cankers was started in the Star Creek Plantation this field season. A five-man crew spent approximately two weeks on this work. The slit method of application was used. This resulted in a high man-day cost per acre as the area worked averaged 700 trees per acre, and a lot of the workers time was spent in searching. The crew was trained in the basal stem treatment but was not able to use the method because of fire suppression work. Limb cankers were present on most of the infected trees which required a lot of pruning.

Effective June 1, 1958, Frank J. Kapel replaced Don F. Williams as staff officer in charge of blister rust control and other insects and diseases.

With continued stress on safety, the operation has completed the seventh consecutive year without a lost-time accident. This makes a total of

175,392 hours since the last lost-time accident.

A one-day functional inspection of the blister rust project was made by C. P. Wessela and W. V. Benedict of the Washington Office on August 2.

By Frank J. Kapel, Forester in Charge

St. Joe National Forest

The administration of the forest pest control program was directed by forest staffman Clyde J. Miller. Wayne F. Painter assisted supervising the checking and blister rust disease survey work. David A. Graham was appointed BRC staff assistant in charge of field operations. The two unit supervisors were Albert E. Turner and John F. Chapman. Six Forest Service camps were operated during the summer field season. Each 35-man field camp included a camp superintendent, 3 assistants, 1 checker, 2 cooks, 1 cook's helper, and 27 laborers.

Ribes eradication work was carried on in parts of the following National Forest control units: North Fork Palouse (159), South Fork Palouse (160), Mannering-East Fork Meadow (155), Ramskull-Willow (116A), East Fork Charlie (117B), West Fork Charlie (117C), Clarkia (130), Cats Spur (132), Keeler-Long Slim (139), Hog Meadow (164), and Nat Brown-Purdue (180). Portions of the Palouse and East Fork Meadow areas were covered to remove ribes from ground disturbed by the severe snow damage of 1949. Eradication crews were trained to rapidly cover these pole stands placing special emphasis on searching snow damage sites where ribes regeneration is still occurring. Crews covered 6,800 acres of this type at an average of .36 man-day per acre and removed 10 ribes per acre. Regular eradication methods were used to work 5,680 acres in the remaining units. This work consisted mostly of eradicating ribes from stream zones, new areas, and isolated concentrations. The checker-flanker method was used to cover an additional 6,000 acres of white pine type having very few ribes. This checker-flanker work was accomplished for .02 man-day per acre.

One 5-man chemical eradication crew operated a truck-mounted power spray unit on cut-over land at the head of Preston and Lacey Creeks in control units 117B and 117C. The chemical spray was applied to kill numerous R. lacustre which had occurred due to recent logging.

The first St. Joe canker-treating crew was organized in June. A mobile unit of five men was trained to apply Acti-dione to infected white pine. This crew treated 52,000 trees in the 20 to 25-year-old Collins, Hidden, Bechtel, and Willow Creek plantations. They spent 370 man-days covering 620 acres. These plantations are now on a maintenance status. However, the presence of ribes in and around the stands after planting resulted in some early lethal infection. The use of Acti-dione will make it possible to save a large percentage of these damaged trees.

Blister rust control crews spent 1697 man-days on fire suppression details during July and August. The crews were dispatched to control fires on the Kootenai, Coeur d'Alene, and Flathead National Forests; the Potlatch Timber Protective Association, and the West St. Joe

Protective Association. All crews were given fire suppression training during June.

A survey of the blister rust damage to the mature white pine stands of the upper St. Joe River area was started in September. David A. Graham trained and supervised a 4-man crew in survey methods. The purpose of this survey was to appraise the extent of lethal infection and establish a sound estimate when the rust-damaged white pine will die. The work this season covered the Quartz Creek Drainage. Surveys will be continued in several other drainages supporting large mature white pine stands during the 1959 field season. Survey results will enable the forest engineers and timber management personnel to prepare realistic cutting schedules as to time and place, and to determine access road priorities.

By Clyde J. Miller, Forester in Charge

1. Expenditures, Calendar Year 1958

Forest	720 Funds	042 Funds	K-V Funds	Totals
Clearwater*	$ 13,522	$133,178	$ 43,549	$ 190,249
Coeur d'Alene	13,543	114,924	25,441	153,908
Kaniksu*	14,431	340,167	16,872	371,470
Kootenai	4,277	33,118	2,114	39,509
St. Joe*	10,695	262,211	2,924	275,830
Totals	$ 56,468	$883,598	$ 90,900	$1,030,966

*Also had cooperative program on state and private lands

2. Organization, 1958

Forest	Camps	Employees	Contractors
Clearwater	5	170	--
Coeur d'Alene	6	140	--
Kaniksu	9	240	18
Kootenai	3	40	--
St. Joe	6	200	--
Totals	29	790	18

3. Ownership in National Forest Units

Forest	State	National Forest Acres	Public Domain Acres	State Acres	Private Acres	Total Acres
Clearwater	Idaho	167,650	370	3,090	7,740	178,850
Coeur d'Alene	Idaho	257,600	--	4,400	7,100	269,100
	Montana	7,900	--	--	3,600	11,500
Subtotal		265,500	--	4,400	10,700	280,600
Kaniksu	Idaho	120,110	--	3,390	19,380	142,880
	Montana	23,760	--	640	1,880	26,280
	Washington*	67,210	--	830	3,070	71,110
Subtotal		211,080	--	4,860	24,330	240,270
Kootenai	Idaho	15,810	--	--	--	15,810
	Montana	72,420	--	--	1,260	73,680
Subtotal		88,230	--	--	1,260	89,490
St. Joe	Idaho	81,700	2,700	12,600	28,300	125,300
Total	Idaho	642,870	3,070	23,480	62,520	731,940
	Montana	104,080	--	640	6,740	111,460
	Washington	67,210	--	830	3,070	71,110
GRAND TOTAL		814,160	3,070	24,950	72,330	914,510

*15,220 acres are in the Colville National Forest

4. Total Progress on Ribes Eradication in 1958

Forest	Working	Regular Work Acres	Checker Flanker Acres	Total Worked Acres	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes
Clearwater	Initial	2,210	--	2,210	2,680	653,000	1.21	295
	Rework	2,260	--	2,260	2,650	155,000	1.17	69
	Maintenance	1,280	--	1,280	940	6,000	.73	5
	Totals	5,750	--	5,750	6,270	814,000	1.09	142
Coeur d'Alene	Initial	540	--	540	1,420	288,000	2.63	533
	Rework	3,310	350	3,660	3,680	86,000	1.00	23
	Maintenance	630	250	880	420	9,000	.48	10
	Totals	4,480	600	5,080	5,520	383,000	1.09	75
Kaniksu	Initial	880	--	880	990	112,000	1.13	127
	Rework	14,000	4,220	18,220	8,550	876,000	.47	48
	Maintenance	6,400	1,880	8,280	2,260	33,000	.27	4
	Totals	21,280	6,100	27,380	11,800	1,021,000	.43	37
Kootenai	Initial	90	--	90	140	38,000	1.56	420
	Rework	500	510	1,010	520	5,000	.51	5
	Maintenance	260	30	290	180	2,000	.62	7
	Totals	850	540	1,390	840	45,000	.60	32
St. Joe	Initial	1,150	--	1,150	1,950	402,000	1.70	350
	Rework	10,920	--	10,920	5,890	140,000	.54	13
	Maintenance	410	6,000	6,410	180	1,000	.03	1
	Totals	12,480	6,000	18,480	8,020	543,000	.43	29
All Forests	Initial	4,870	--	4,870	7,180	1,493,000	1.47	307
	Rework	30,990	5,080	36,070	21,290	1,262,000	.59	35
	Maintenance	8,980	8,160	17,140	3,980	51,000	.23	3
	Totals	44,840	13,240	58,080	32,450	2,806,000	.56	48

5. K-V Work in 1957

Forest	Acres Worked	Man-Days
Clearwater	2,460	2,070
Coeur d'Alene	500	930
Kaniksu	1,800	780
Kootenai	40	60
St. Joe	170	260
Totals	4,970	4,100

6. Chemical Eradication in 1958

Forest	Acres	Man-days	Ribes	Gallons
Clearwater	440	640	488,000	41,000
Coeur d'Alene	550	1,230	283,000	88,000
Kaniksu	680	1,230	849,000	164,000
Kootenai	90	140	38,000	21,000
St. Joe	90	320	162,000	31,000
Total	1,850	3,560	1,820,000	345,000

7. Contracting in 1958

Forest	Number of Contracts	Acres	Man-days	Ribes	Dollars
Kaniksu	35	1,550	1,340	13,500	$20,331

8. Acres in Control Area

Forest	Total	Age Classes by Stand Origin				
		1941-1960	1921-1940	1881-1920	1841-1880	Before 1841
Clearwater	178,850	12,890	15,790	38,350	11,860	99,960
Coeur d'Alene	280,600	8,600	61,000	41,100	17,300	152,600
Kaniksu	240,270	13,880	60,190	95,420	12,700	58,080
Kootenai	89,490	420	3,040	38,680	5,550	41,800
St. Joe	125,300	4,800	47,900	64,400	4,700	3,500
Totals	914,510	40,590	187,920	277,950	52,110	355,940

9. Summary of Control Status

Forest	Total Acres	Unworked Acres	Worked Area		
			Needing Rework Acres	Needing Re-examination Acres	On Maintenance Acres
Clearwater	178,850	83,670	20,870	39,090	35,220
Coeur d'Alene	280,600	85,860	51,350	94,980	48,410
Kaniksu	240,270	16,760	26,520	58,220	138,770
Kootenai	89,490	41,470	5,640	7,520	34,860
St. Joe	125,300	2,100	27,300	44,800	51,100
Total	914,510	229,860	131,680	244,610	308,360

10. Acti-dione Work in 1958

Forest	Acres	Man-days	Trees Treated
Clearwater	310	440	74,600
Coeur d'Alene	150	200	19,400
Kaniksu	570	550	118,200
Kootenai	30	70	13,100
St. Joe	620	370	52,000
Total	1,680	1,630	277,300

III. STATE AND PRIVATE PROGRAM (IDAHO)

Clearwater Timber Protective Association (Clearwater N.F.)

A change in priority of units to be worked on the Clearwater Timber Protective Association was made at the start of the 1958 field season when it was decided to discontinue blister rust control work in Washington Creek. This decision was made on the basis of surveys conducted by foresters of Potlatch Forests, Inc. and the Federal government. When work was started in this unit there were large numbers of ribes which had been present for a sufficient period of time so that the white pine reproduction was practically all infected. Surveys conducted at that time showed a sufficient residual mature white pine stand to accomplish natural regeneration after the ribes had been removed. However, the more recent surveys of the spring of 1958 revealed an abnormal, very rapid and generally distributed deterioration of the mature residual stand. By the time the ribes could be removed there would not have been sufficient white pine remaining for an adequate seed source to restock the area. Therefore, after consultation with foresters of the State of Idaho and other major landowners involved, it was decided to transfer the blister rust control work planned for Washington Creek to Unit 16, Snake Creek. More volume of white pine can be produced per dollar of blister rust protection cost on this unit than on any other white pine management unit within the present program on the Association where work has not yet been initiated.

Two camps were established on lands of the Clearwater Timber Protective Association. One camp worked in Unit 6, Hildebrand and one in Unit 16, Snake Creek. The Hildebrand crew performed the necessary rework in the Hildebrand Plantation and its protective zone and performed rework in Orofino Creek adjacent to the National Forest boundary. The Snake Creek Camp conducted initial working at the head of the drainage in logged areas where excellent seed source remains and in the white pine pole stand on the north side of Snake Creek. Two truck-mounted sprayers were used in the heavier ribes concentrations.

In 1959 it is planned to continue the work in Snake Creek and do the necessary rework in Browns Creek and in other scattered areas in the vicinity of the Hildebrand Work Center. It is also planned to do Acti-dione work on selected areas where ribes eradication has been completed and infected trees can be saved from blister rust.

Potlatch Timber Protective Association (St. Joe National Forest)

The State and Private Blister Rust Control Program was supervised by the Forest Service BRC staff. The two camps were organized similar to the Forest Service units.

A 35-man camp located at Squaw Creek, near Elk River, completed currently needed hand-eradication work in the Cameron (188A), Shattuck-Squaw (188B), Elk Creek (187A), and Bull Run (190) control units. The second camp was located on the East Fork of Potlatch Creek near the mouth of Bobs Creek. Crews from this camp worked cut-over areas in the Fry (181A), Bobs (181B), and Bloom Meadow (185A) units.

Extensive eradication work in the present control boundaries of the State and Private, and intermingled ownership units near Elk River has been completed. Future periodic eradication work will be necessary only along streams where erosion from high water continually causes light ribes regeneration.

Plans have been made to work a 5-man canker-treating crew near Elk River in 1959. This crew will apply Acti-dione to white pine pole and reproduction damaged before blister rust control was established. Special emphasis will be placed on the treatment of lightly-stocked areas. The treatment of rust-damaged white pine in lightly-stocked areas will increase chances for future stocking by reserving additional white pine seed source.

Blister rust control and logging plans are discussed by Forest Service, State, and P.T.P. A. cooperators prior to the start of the field season. This advance cooperative planning results in more effective control work.

Priest Lake Timber Protective Association (Kaniksu N.F.)

Blister Rust Control work was performed in two State and Private units, and in one unit which was financed jointly by State and Private and Federal funds. Portions of the two State and Private units, Caribou Creek and Bear Creek, were worked by a 25-man camp located at the north end of Priest Lake. Most of the supplies and subsistence for this camp were brought in by boat. Another 25-man camp, operating out of Shiloh Guard Station, performed work in Trail Creek, an intermingled ownership unit.

Checkers from the two camps status checked 2,700 acres in preparation for next year's work. The production percentage figure for eradication was 0.34 man-day per acre.

An Idaho State Plantation adjacent to Cuban Hill was treated with Acti-dione by a crew of six men. This treatment initiated the Acti-dione program on State and Private lands. Further application of Acti-dione is planned for next year in the Bear Creek Unit.

Blister rust crews from four camps expended a total of 466 man-days in the suppression of two rather large fires on State of Idaho protected lands.

1. Expenditures, Calendar Year 1958

Timber Protective Association	Federal Funds			State & Private Funds			Total All Funds
	720	411	Total	State	Private	Total	
Clearwater	$ 9,015	$38,918	$47,933	$28,201	$10,697	$38,898	$86,831
Potlatch (St. Joe)	4,159	37,494	41,653	24,832	8,578	33,410	75,063
Priest Lake (Kaniksu)	2,000	13,182	15,182	6,515	6,292	12,807	27,989
Totals	$15,174	$89,594	$104,768	$59,548	$25,567	$85,115	$189,883

720 - Leadership funds
411 - Cooperative Control Funds

2. Field Organization, 1958

Area	Camps	Employees
Clearwater T.P.A.	2	100
Potlatch T.P.A. (St. Joe)	2	80
Priest Lake T.P.A. (Kaniksu)	2	50
Total State & Private	6	230

3. Ownership in State and Private Units

Area	State Acres	Private Acres	Public Domain Acres	National Forest Acres	Total Acres
Clearwater T.P.A.	15,440	51,140	1,330	2,050	69,960
Potlatch T.P.A. (St. Joe)	17,300	37,300	2,500	5,100	62,200
Priest Lake T.P.A. (Kaniksu)	29,520	3,730	--	3,330	36,580
Other State & Private (Kaniksu)	690	3,510	--	3,720	7,920
Totals	62,950	95,680	3,830	14,200	176,660

4. Total Progress on Ribes Eradication in 1958

Area	Working	Regular Work Acres	Checker Flanker Acres	Total Worked Acres	Man-days	Ribes	Per Acre Man-Days	Per Acre Ribes
Clearwater T.P.A.	Initial	1,180	--	1,180	1,940	1,184,000	1.64	1,003
	Rework	1,250	--	1,250	1,900	25,000	1.52	200
	Maintenance	--	--	--	--	--	--	--
	Totals	2,430	--	2,430	3,840	1,209,000	1.58	498
Potlatch T.P.A.	Initial	150	--	150	230	119,000	1.53	793
	Rework	2,460	--	2,460	2,200	29,000	.89	12
	Maintenance	700	2,540	3,240	600	10,000	.19	3
	Totals	3,310	2,540	5,850	3,030	158,000	.52	27
Priest Lake T.P.A.	Initial	--	--	--	--	--	--	--
	Rework	990	450	1,440	550	16,000	.38	11
	Maintenance	510	1,010	1,520	450	6,000	.30	4
	Totals	1,500	1,460	2,960	1,000	22,000	.34	7
All Areas	Initial	1,330	--	1,330	2,170	1,303,000	1.63	980
	Rework	4,700	450	5,150	4,650	70,000	.90	14
	Maintenance	1,210	3,550	4,760	1,050	16,000	.22	3
	Totals	7,240	4,000	11,240	7,870	1,389,000	.70	124

5. Chemical Eradication in 1958

Area	Acres	Man-days	Ribes	Gallons
Clearwater T.P.A.	250	410	1,080,000	51,000

6. Acres in Control Area

Area	Total	Age Classes by Stand Origin: 1941-1960	1921-1940	1881-1920	1841-1880	Before 1841
Clearwater T.P.A.	69,960	10,910	34,770	5,200	3,050	16,030
Potlatch T.P.A. (St.Joe)	62,200	12,700	15,800	21,500	2,400	9,800
Priest Lake T.P.A.(Kaniksu)	44,500	1,040	12,680	19,150	1,110	10,520
Totals	176,660	24,650	63,250	45,850	6,560	36,350

7. Summary of Control Status

Area	Total Acres	Unworked Acres	Needing Rework Acres	Needing Re-examination Acres	On Maintenance Acres
Clearwater T.P.A.	69,960	20,260	13,600	14,190	21,910
Potlatch T.P.A.(St. Joe)	62,200	8,800	17,300	15,800	20,300
Priest Lake T.P.A.(Kaniksu)	44,500	4,250	4,550	13,320	22,380
Totals	176,660	33,310	35,450	43,310	64,590

8. Acti-dione Work in 1958

Area	Acres	Man-days	Trees
Priest Lake T.P.A. (Kaniksu)	90	40	16,900

IV. NATIONAL PARK PROGRAM

The 1958 National Park Service Region II white pine blister rust control program was carried on under the cooperative agreement with the U. S. Department of the Interior. The U. S. Forest Service provided leadership, coordination, technical direction and certain operational services requested by the Park Service.

Personnel Participating

Glacier	Stanley H. Spurgeon, Supervisory Park Ranger, in charge
Yellowstone	H. O. Edwards, Park Forester (acting), in charge John N. Reeves, Forestry Aid, Unit Supervisor
Rocky Mountain	Harry During, Chief Ranger Robert Weldon, Park Forester, in charge
Grand Teton	Stanley Browman, District Ranger, in charge
NPS Region II	Maynard Barrows, Consulting Forester
U. S. Forest Service Region 1	John C. Gynn, Forester, in charge C. M. Chapman, Forester

Objectives. The program was designed to accomplish scheduled initial ribes eradication, rework, maintenance control, and to complete 1957 unfinished work in Yellowstone.

Accomplishments. The 1958 progress summary shows that more acres were worked at a lower man-day per acre average than ever before in the National Park Service, Region II program. All initial work production goals were achieved or exceeded. Because of time lost to forest fire suppression, two small portions of rework were not completed.

Initial work finished on several areas. Initial ribes eradication was completed on the following units: Park Headquarters extension, Glacier; Craig Pass extension, Yellowstone; Snake River-Deadman's Bar, Grand Teton (one year ahead of schedule); and Boulder Brook, Rocky Mountain.

Control status. Of the total 1958 worked acres 8,200 were placed on maintenance control. Seventy-seven percent of the total acres worked to-date have now been classified into the maintenance category.

Checking and surveys. Efficiency checks were made on all 1958 workings and mop-up performed as required. Ribes status checks were made on 2,400 acres in unworked and unclassified areas to obtain data necessary for planning future work. A white pine and ribes distribution survey requested by Forester Barrows was made on 980 acres adjacent to the present control unit in Grand Teton to determine desirability of extending the control area.

Power loader developed for Hi-Fog sprayers. Three newly developed power-driven pumps for filling high pressure backpack Hi-Fog sprayers were purchased and improved. The hand-operated pumps were removed from 10 Hi-Fog sprayers and replaced with attachments required for power filling. This

conversion decreased the weight of each unit seven pounds and increased net fluid content working capacity over 30 percent. Besides the large amount of human energy conserved, time saved in filling in 1958 more than off-set the purchase cost of the three power loaders.

Extensive use made of checker-flanker method in 1958. Although initial work, the light ribes distribution, gentle topography, and good visibility made most of the Craig Pass extension and parts of the Canyon areas in Yellowstone particularly well-suited for extensive use of checker-flanker method. This method of ribes eradication consists of one or two high quality men flanking a checker or compassman and rapidly searching ribes sites on the work strip. The strips are systematically run, usually in cardinal directions, and at intervals spaced to assure complete coverage. A large part of the acreage worked initially in Yellowstone was done by this method.

Acti-dione tested on high altitude white pine species in Glacier. The antibiotic Acti-dione (cycloheximide), used extensively during 1958 in Idaho to kill blister rust cankers on western white pine, is being tested on limber pine (Pinus flexilis)and white bark pine (P. albicaulis) in Glacier and the adjacent Blackfeet Indian Reservation.

New Forestry Aid position set up in Yellowstone. Because of the size and nature of the Yellowstone blister rust control program, a forestry aid position was established and filled. The assistance of this man resulted in a more integrated, effective and efficient control program.

1. Expenditures, Calendar Year 1958

National Park	National Park BRC	Forest Service Leadership and Technical Direction	Totals
Glacier	$ 17,590	$ 2,823	$ 20,413
Yellowstone	116,289	5,332	121,621
Grand Teton	7,539	732	8,271
Rocky Mountain	13,467	1,568	15,035
Totals	$154,885	$10,455	$165,340

2. Field Organization, 1958

National Park	Camps	Employees
Glacier	2	19
Yellowstone	4	82
Grand Teton	1	5
Rocky Mountain	1	12
Totals	8	118

3. Total Progress on Ribes Eradication in 1958

National Park	Working	Regular Work Acres	Checker Flanker Acres	Total Worked Acres	Man-days	Ribes	Per Acre Man-days	Per Acre Ribes
Glacier	Initial	140	160	300	330	23,000	1.10	77
	Rework	250	70	320	280	2,000	.88	6
	Maintenance	--	660	660	100	1,000	.15	2
	Totals	390	890	1,280	710	26,000	.55	20
Yellowstone	Initial	1,330	6,930	8,260	2,670	367,000	.32	44
	Rework	1,970	--	1,970	1,330	105,000	.68	53
	Maintenance	160	270	430	30	1,000	.07	2
	Totals	3,460	7,200	10,660	4,030	473,000	.38	44
Grand Teton	Initial	60	330	390	180	39,000	.46	100
	Rework	80	210	290	100	12,000	.34	41
	Maintenance	--	--	--	--	--	--	--
	Totals	140	540	680	280	51,000	.41	75
Rocky Mountain	Initial	340	110	450	470	42,000	1.04	93
	Rework	190	310	500	130	1,000	.26	2
	Maintenance	--	--	--	--	--	--	--
	Totals	530	420	950	600	43,000	.63	45
All Parks	Initial	1,870	7,530	9,400	3,650	471,000	.39	50
	Rework	2,490	590	3,080	1,840	120,000	.60	39
	Maintenance	160	930	1,090	130	2,000	.12	2
	Totals	4,520	9,050	13,570	5,620	593,000	.41	44

4. Chemical Ribes Eradication in 1958

National Park	Acres	Man-days	Ribes	Gallons
Yellowstone	890	1,940	326,600	59,000
Grand Teton	80	150	43,100	7,000
Rocky Mountain	140	250	32,300	7,000
Totals	1,110	2,340	402,000	73,000

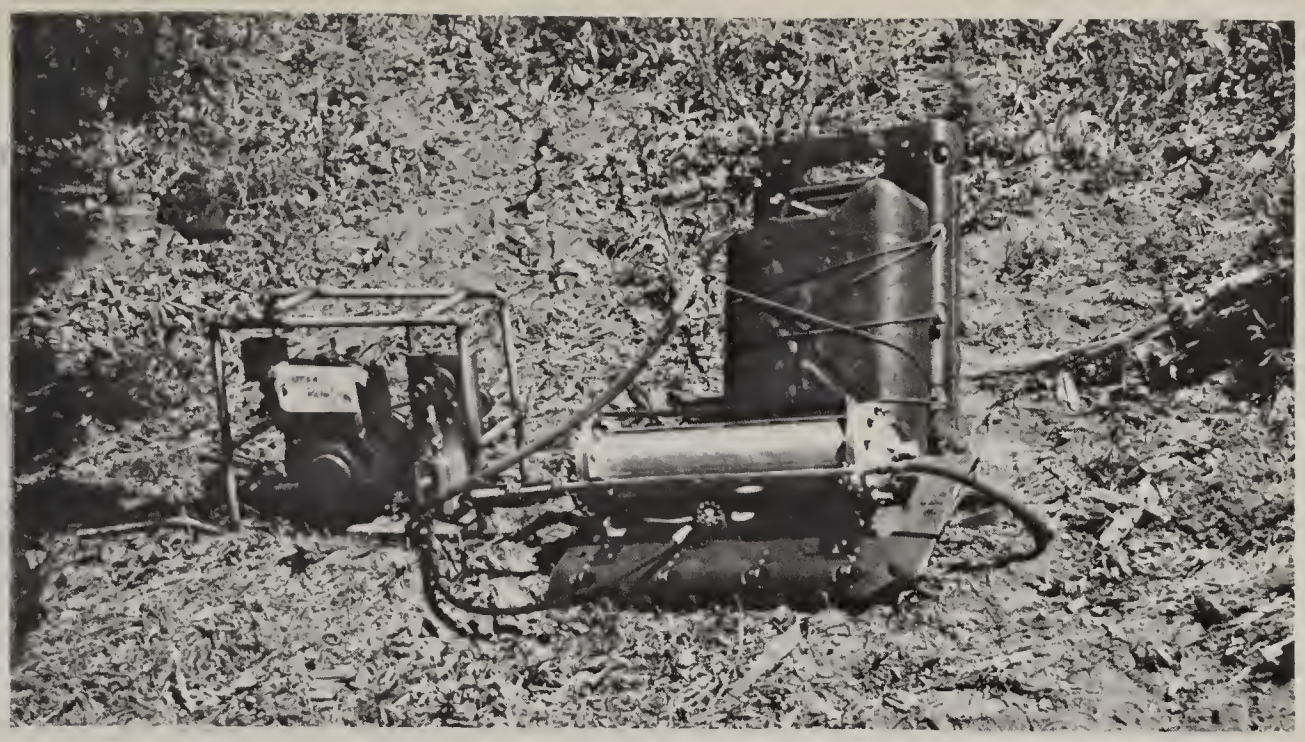
5. Summary of Control Status

National Park	Total Acres	Unworked Acres	Worked Area		
			Needing Rework Acres	Needing Re-examination Acres	On Maintenance Acres
Glacier	6,010	320	860	920	3,910
Yellowstone	33,290	11,160	1,600	4,370	16,160
Grand Teton	1,010	--	--	100	910
Rocky Mountain	12,650	4,050	630	230	7,740
Totals	52,960	15,530	3,090	5,620	28,720

Recommendations for National Park Service Program in Calendar Year 1959. The following recommended field program reflects changes made in Yellowstone because of inadequate housing facilities at the start of the 1958 season, and completion of ribes eradication one year ahead of schedule in Grand Teton. Additional men should be hired at the start of the 1959 season to cover man-day losses that will occur due to late arrivals, quits, fire suppression, and employees leaving early. Recommendations are based on a six-day work week for a complete three-month working season.

Area	GS-6 Camp Superintendent	GS-5 Checker	Foreman	Working Leadmen	Laborers	Total
Glacier						
Rising Sun	--	--	--	1	5	6
Oldman Lake	1*	1*	--	1	7**	10
Totals	1	1	--	2	12	16
Yellowstone						
Maintenance	--	--	1	3	10	14
Antelope Creek	1	1*	--	3	12	17
Canyon	1	2	2	11	42	58
Totals	2	3	3	17	64	89
Rocky Mountain						
Maintenance	--	1*	--	--	2	3
Hidden Valley	1*	--	--	2	7***	10
Totals	1	1	--	2	9	13
Total All Parks	4	5	3	21	85	118

* Serves two camps
** Includes 2 men from Grand Teton
*** Includes 3 men from Grand Teton



New Power Loader: Filling high pressure Hi-Fog sprayer with 2,4,5-T from Jeep can.

Hi-Fog Sprayer: Hi-Fog sprayer mounted on Army mountain-type packboard for comfortable carrying in high altitudes.

Yellowstone National Park: Crewmen treating Ribes montigenum with 2,4,5-T using Hi-Fog sprayers.

V. SCOUTING FOR WHITE PINE BLISTER RUST, 1958

Scouting for blister rust (*Cronartium ribicola*) was limited to Montana, Wyoming, and northern Colorado. Inspections were made in 43 drainages on 5 national forests, 3 national parks and one Indian reservation. Examinations were made on 8,390 white pine (*Pinus albicaulis* and *P. flexilis*) and 5,200 ribes located in sites favorable for the development of white pine blister rust. All ribes examined were of the species most susceptible to infection by blister rust.

Blister rust infection has been found previously in all units listed below in Montana and Wyoming. No blister rust infection has been found in Colorado up to December 1958.

No new infection centers were found in 1958 although considerable buildup of the rust was noted in Montana and Wyoming adjacent to several controlled areas.

Scouting Summary, 1958

Location	Drainages Scouted	Ribes Examined	Pine Examined
Montana			
Gallatin National Forest	2	300	270
Blackfeet Indian Reservation	1	200	400
Wyoming			
Shoshone National Forest	15	1,220	1,310
*Teton National Forest	6	600	210
Yellowstone National Park	8	1,410	4,160
Grand Teton National Park	5	970	1,590
*Medicine Bow National Forest	2	100	100
Colorado			
Rocky Mountain National Park	2	200	250
*Roosevelt National Forest	2	200	100
Totals	43	5,200	8,390

*Pinon rust found. Denotes conditions are also favorable for white pine blister rust.

VI. DEVELOPMENT AND IMPROVEMENT OF BLISTER RUST CONTROL METHODS, 1958

A. New Chemicals Tested for Control of Ribes, Brush, and Weeds

Brush killer-type chemicals laboratory and field tested on ribes in 1958 included the following: (1) emulsifiable concentrate (aqueous form) trichlorobenzoic acid, (2) pelletized trichlorobenzoic acid, (3) invert emulsion 2,4,5-trichlorophenoxyacetic acid, (4) oil emulsion 2,4,5-trichlorophenoxypropionic acid, and (5) Simazin 50W, 2-chloro-4,6-bis-(ethylamino)-s-triazine. Trichlorobenzoic acid was applied at rates of 2 and 4 pounds acid equivalent per 100 gallons of water in soil drench versus foliage spray tests on Ribes viscosissimum and lacustre. Half-acre plots were sprayed by a Coeur d'Alene chemical crew in July. Other materials were applied in August and September during the seasonal period of past active plant growth.

Dalapon, 2,2-dichloropropionic acid, was applied by a Kaniksu chemical crew for the control of quack grass, Agropyron repens, on the rust-resistant seed orchard site at Sandpoint, Idaho. Other chemicals tested for the control of bind weed, Convolvulus arvensis; Canada thistle, Cirsium arvense; and common tansy, Tanacetum vulgare, in rust-resistant outplanting sites and forest nurseries included the following: trichlorobenzoic acid and 3-amino-1,2,4-triazole.

Progress in the development of chemicals for killing ribes was reported by H. R. Offord, Clarence R. Quick, and Virgil D. Moss, in an article "Blister Rust Control Aided by the Use of Chemicals for Killing Ribes," Journal of Forestry 56(1): 12-18, 1958.

B. Antibiotic Treatment of Infected White Pine

1. Results of 1957 tests

a. Acti-dione and cycloheximide derivatives

(1) Foliage spray. Aqueous solutions Acti-dione and cycloheximide semicarbazone, oxime, and acetate, 50, 100, and 200 ppm, were tested on 15-year-old white pines with trunk and branch infections. A gallon of each formulation was uniformly applied to 10 trees. Triton B-1956, 100 ppm, was used for a wetting agent. Trees were actively growing when sprayed, June 17 and 18.

Cycloheximide oxime, 200 ppm, killed 60 percent trunk cankers and 100 percent branch cankers. These results were the best obtained in the foliage spray tests. Oxime, 100 ppm, was nearly as effective, killing 50 percent trunk cankers and all branch cankers. Arranged in order of increasing effectiveness, cycloheximide acetate, cycloheximide semicarbazone, Acti-dione T, and Acti-dione AA, killed 10 to 40 percent trunk cankers, and 30 to 80 percent branch cankers. Three-year-old needles and about two-thirds of the 2-year-old needles on lower branches were killed by Acti-dione and cycloheximide derivative forms. These age needles were equally damaged by all antibiotic concentrations. Sprays were not injurious to terminal shoots, branch tips,

current-year-old needles, and foliage on the upper two-thirds of crowns.

(2) Soil drench. Aqueous solutions cycloheximide semicarbazone, 50, 100, and 200 ppm, were tested on 15-year-old white pines with trunk and branch infections. A gallon of each concentration was uniformly applied in soil drenching 10 trees. Semicarbazone, 100 and 200 ppm, killed 40 percent trunk cankers, and 90 and 80 percent branch cankers, respectively. Foliage was not damaged by this type of treatment.

(3) Trunk canker treatments. Tests were made to evaluate (1) fungicidal properties of several Acti-dione and cycloheximide derivative formulations, and (2) methods in applying antibiotic solution to trunk cankers on reproduction and pole-size white pines. To represent seasonal periods of active and past active tree growth, trunk canker tests were established mid-June and late August.

Emulsifiable concentrates of the antibiotic forms were diluted to 50, 100, 150, and 200 ppm in No. 1 stove oil. Acti-dione and cycloheximide derivative formulations are shown:

Acti-dione		Cycloheximide derivative
Acti-dione	.60%	
"	2.40%	semicarbazone
"	2.56%	oxime
"	3.84%	acetate

Antibiotic solutions were applied to trunk cankers by these methods: injection, excise, slit, and intact. All require searching in examining trees for infections. Procedures used in the treatments are described:

(a) Injection. Using a veterinary hypodermic syringe and No. 14 needles in 2-1/2 and 3-1/2 inch lengths, 2 to 3 ml. of antibiotic-stove oil solution was injected downward in bark 1 inch above the outer margin of surface discoloration distal end of cankers.

(b) Excise. Lower limbs from 1/3 the crown height of trees first were pruned by shears and saw to eliminate branch infections and facilitate working close to the trunk in canker treatment. A light film of spray was applied to the diseased bark area of the trunk to distinctly outline the margin of discoloration. A hatchet was used to remove dead and dying bark from inside the margin of discoloration by starting the cut 1 inch and 2 inches above the outer limit of surface discoloration on reproduction and pole-size trees, respectively. Then the cut was extended downward along the visible canker margin to end at the proximal limit of surface discoloration. Treatment was completed by wetting cut surfaces to the runoff point with antibiotic solution.

(c) Slit. In place of cutting out bark the canker margin was slit, otherwise procedures were the same for the slit and excise methods. Slits cut 1 to 3 inches long by a hatchet were centered on the canker margin at the four angular summits of discoloration (i.e. Top, bottom, and sides). For spacing slits about 4 inches apart, large cankers were cut between angular summits of discoloration.

(d) Intact. The diseased portion of the trunk was wet to the runoff point with antibiotic solution. Solution was applied 4 to 6 inches beyond outer limits of surface discoloration.

Only Acti-dione was effective in all four methods of trunk canker treatment. Slight differences in fungicidal properties occurred between Acti-dione forms. Best results were obtained by antibiotic solution prepared from the emulsifiable concentrate Acti-dione 3.84% w/v. This form was to be later registered as Acti-dione BR, trademark of the Upjohn Company, Kalamazoo, Michigan.

Results of Methods in Trunk Canker Treatment with Acti-dione BR (3.84% w/v) Emulsifiable Concentrate Diluted to 50, 100, 150, and 200 ppm in No. 1 Stove Oil

Method	Treatment Date*	Percent trunk cankers killed							
		Reproduction				Pole			
		50 ppm	100 ppm	150 ppm	200 ppm	50 ppm	100 ppm	150 ppm	200 ppm
Injection	June	60	90	100	100				
	August	50	80	100	100				
Excise	June	70	100	100	100	80	100	100	100
	August	70	100	100	100	70	100	100	100
Slit	June	70	100	100	100	80	100	100	100
	August	80	100	100	100	80	100	100	100
Intact	June	70	100	100	100				
	August	60	90	100	100				

* Mid-June and late August treatments represent seasonal periods of active and past active tree growth.

2. Antibiotic tests in 1958

a. Acti-dione and cycloheximide derivatives

(1) Basal stem method. In 1957 tests of Acti-dione stove oil solution, trunk infections were successfully killed by

spraying intact cankers on 20-year-old and younger white pines. Treatment consisted in examining trees first for trunk infections then applying spray to the diseased bark portions of the trunks. Spraying trees in this manner eliminated two operations of the excise and slit methods of trunk canker treatment; namely, (1) pruning limbs to facilitate working close to the trunk in canker treatment, and (2) slitting or cutting out diseased bark to aid spray penetration. In killing trunk infections by spraying the diseased bark portion of trunks, it was obvious trees could be successfully treated by spraying the basal portion of trunks without searching for cankers. Searching time is a costly operation of a control method whether looking for cankers or ribes.

There were several objectives for basal stem tests in 1958; namely, (1) demonstrations in killing trunk and branch infections by spraying basal portions of trunks without examining trees for cankers, (2) development of application techniques for treatment of pole and larger size trees, and (3) establishing method effectiveness in relation to antibiotic concentrations, diluents, wetting agents, seasonal period of tree growth, stage of canker development, translocation of material, and bark portion of trunk and branches sprayed.

(a) Concentrations - Active ingredient in spray formulations consisted of cycloheximide, 50, 100, 150, and 200 ppm.

(b) Diluents - No. 1 stove (fuel) oil was used to dilute Acti-dione BR "concentrate" in spray formulations. In a study to overcome the resistance of bark surface to wetting and penetration (described under item 3), petroleum cleaning solvent was used to dilute Acti-dione BR "concentrate" in one test of a series on spray carriers.

(c) Wetting agents - The non-ionic polyether alcohol-type compound Triton X-155 at 50, 100, 150, and 200 ppm was used to reduce the interfacial tension between oil spray and bark surface. In other tests to lower surface tension, stove oil and petroleum cleaning solvent were combined in the following proportions:

Formulation Number	Stove oil Pints	Cleaning Solvent Pints
A	8	0
B	7	1
C	6	2
D	4	4
E	2	6
F	0	8

(d) Number trees - Ten trees were used in testing each formulation.

(e) Seasonal growth period of trees - Treatments applied mid-June and replicated late August represent seasonal periods of active and past active tree growth. Basal stem work was continued into November by some forests.

(f) Canker stage - Trees were selected to include about equal numbers of juvenile, pycnial, and aecial stage cankers.

(g) Translocation - Trunk and branch infections several feet high in tree crowns have been killed in applying Acti-dione stove oil solution to the basal portion of trunks by the excise and slit methods. Trees in all basal stem tests and others specifically selected for their height and/or stage of cankerdevelopment are being used to determine distances and effectiveness of Acti-dione in killing upper crown infections.

(h) Trunk and branch portions sprayed - Spray is presently applied from opposite sides of a trunk while wetting about 18 inches of the basal portion of lower branches. To explore the possibilities in further simplifying treatment, spray was applied to single and opposite sides of trunks by wetting and not wetting basal portions of lower branches.

(2) Foliage sprays - Acti-dione BR "concentrate" diluted to 100 and 200 ppm in No. 1 stove oil and petroleum cleaning solvent was applied to foliage of 15-year-old white pines with trunk and branch infections. Treatments applied in late August represent the seasonal period of past active tree growth. Acti-dione concentrations and diluent volumes are shown:

Formulation No.	Acti-dione ppm.	Stove oil pints	Cleaning solvent pints
A	0	--	8
B	100	--	8
C	200	--	8
D	0	4	4
E	100	4	4
F	200	4	4
G	0	8	--
H	100	8	--
I	200	8	--

Aqueous solution tests included cycloheximide semicarbazone and cycloheximide oxime, 50, 100, and 200 ppm, prepared from 1 percent and 3 percent emulsifiable concentrates.

(3) Seedling immunization - Possibilities in immunizing white pine seedlings against blister rust infection by applying antibiotics to soil in the nursery were investigated. Development of a successful treatment coupled with favorable lasting results, will permit planting prescribed controlled burns in the ashes before ribes control work is completed, and areas become brush and sod covered.

Procedures in antibiotic and inoculation treatments are described: A hundred each of 1-0 and 2-1 white pine seedlings planted in 7-inch pots at the Coeur d'Alene nursery were moved to Spokane for antibiotic and artificial inoculation treatments. Pots of the same-age seedlings were placed in separate heeling beds 4 feet wide and 16 feet long. Each bed was partitioned into 5 compartments containing 20 potted pines for randomized treatment. A moisture-temperature chamber was constructed over the heeling beds. Of wooden frame, walls were covered with polyethylene and the top by a canvas fly. Moisture and temperature controls for optimum infection conditions were maintained by sprinklers.

Aqueous solutions Acti-dione and cycloheximide, semicarbazone, oxime, and acetate, 25, 50, 100, and 200 ppm, were applied by pouring 200 milliliter volumes into the top of pots 1 week ahead of artificial inoculation. Branches of R. viscosissimum containing fertile blister rust inoculum were placed upright in pine pots to form a canopy covering the seedling beds. Artificial inoculation under optimum infection conditions of 100 percent humidity and temperature range 55 to 60 degrees F. was maintained for an 80-hour period from September 30 to October 3.

(4) Cooperation - Emulsifiable concentrates of Acti-dione and cycloheximide derivatives used in the preparation of antibiotic solutions for basal stem, foliage, and soil drench treatments were developed in cooperation with Drs. William Klomparens, Director, and Gerald A. Boyack, Formulation Chemist, Agricultural Research and Development, The Upjohn Company, Kalamazoo, Michigan. Upjohn personnel and dates of visitations for office and field conferences in 1958 were as follows: May 14 to 16, William Klomparens, William DeCou, and Rocco Lipari; October 1 to 3, Gerald A. Boyack.

In Glacier National Park, basal stem and foliage spray methods in Acti-dione treatment were tested on whitebark pine, Pinus albicaulis, and limber pine, P. flexilis, September 22 to 24. Plans for Acti-dione work in 1959 were discussed with park officials, also.

b. Phytoactin and phytostreptin antibiotics - These two new closely related antifungal antibiotics were discovered and isolated at the Pabst Laboratories, Milwaukee, Wisconsin. Experimental quantities were obtained to test on western white pine in 1958.

(1) Foliage spray - Aqueous solutions phytoactin and phytostreptin, 100, 200, 400, and 800 ppm, were applied to 15-year-old white pines with trunk and branch infections. Triton X-155, 200 ppm, was used for a wetting agent. A gallon of each formulation was uniformly applied to 10 trees. The trees were actively growing when sprayed June 16 and 17. In examining trees October 29, trunk and branch infections were observed dying or killed by phytoactin. Foliage was not injured by either antibiotic.

(2) Slit method - Stove oil-isopropanol solvent mixtures of phytoactin and phytostreptin, 100 and 200 ppm, were applied to incised trunk cankers on 15-year-old white pines to determine the fungicidal properties of these antibiotics. Triton X-155, 100 ppm, was used for a wetting agent. To facilitate spray penetration, top, bottom, and sides of cankers were slit with a hatchet. These 4 slits were centered on the margin of surface discoloration.

c. Other antifungal antibiotic substances - Griseofulvin, Aniscomycin, Compound RH, Rimocidin sulphate, Oligomycin, and Agrimycin compounds were not effective on blister rust cankers in 1957 tests.

d. Publications - Progress through 1957 in developing Acti-dione methods for trunk canker treatment was reported in an article "Acti-dione Stove Oil Treatment of Blister Rust Trunk Cankers on Reproduction and Pole Western White Pine," Plant Disease Reporter 42(5): 703-706, May 15, 1958.

C. Status of Ribes Ecology Studies

Studies in integrating timber cutting and slash disposal practices with blister rust control were continued in cooperation with timber management and fire control staff officers on white pine forests; Inland Empire Research Center; College of Forestry, University of Idaho; and Potlatch Forests, Incorporated. Encouraging results in destroying ribes plants and stored seed on clearcut areas are being obtained in disposing of slash by a hard-broadcast control burn the year of cutting. Good single burns and areas of slash dozer-piled and burned have similar ribes regeneration problems. Most areas can be sprayed for ribes the second year following burning.

By Virgil D. Moss, Research Forester

Figure 1. Basal Stem Method. Lower third of trunk and 18 inches basal portion of branches on western white pine reproduction with trunk and branch infections sprayed with Acti-dione BR, 150 ppm, No. 1 stove oil solution, June 20 and photographed October 29, 1958. Two-year-old and 3-year-old needles on lower branches killed by spray reduces blister rust infection target area.

Figure 2. Basal Stem Method. Close-up of tree right background (Fig. 1) showing trunk canker killed by basal stem Acti-dione application. Blackened area of dead bark approximately outlines limits of canker discoloration at time of treatment. This bark portion, perforated by mycelium, dies after canker is killed by Acti-dione.

VII. DEVELOPMENT OF RUST RESISTANT WHITE PINE, 1958

New Genetics Center in Operation

The Northern Idaho Forest Genetics Center, a cooperative venture of Region 1 and the Intermountain Forest and Range Experiment Station with the University of Idaho, opened September 22, 1958. The main function of the new center will be continued, with accelerated work on the breeding of blister rust resistant western white pine. Work on improvement of growth rate and timber quality of white pine and other coniferous species will continue to be a second major project.

Region 1 and the Intermountain Experiment Station have financed construction and equipment of the center, amounting to approximately $70,000. Meanwhile, the University, also recognizing the value of white pine in Idaho's forest economy, has provided an accessible headquarters building site, plus a resistant tree arboretum and experimental area, together valued at approximately $30,000. Both the headquarters and arboretum areas are covered by 35-year free leases or agreements. In addition, the University has relinquished half of its water rights in Paradise Creek, allowing for sprinkler irrigation of the resistant tree arboretum, and the University Farm performs all necessary farm operations in the arboretum area for a nominal fee.

Office, laboratory, greenhouse, lathhouse, and experimental nursery facilities are located on a two-acre headquarters site at 1221 South Main Street, Moscow, Idaho. The irrigated forty-acre arboretum area, currently about half planted, is located about one-half mile south of the Moscow-Pullman Highway, just to the east of the Idaho-Washington State line. Field plot work, previously centered at Clarkia, Idaho, but spread between Saltese, Montana and Elk River, Idaho, is being slowly consolidated at Moscow. This is particularly important in respect to accumulating and preserving selected, first-generation rust resistant seedlings, painstakingly isolated during almost ten years of preliminary progeny test work. This extremely valuable stock, the basic germ plasm toward breeding for increased resistance, can at last be preserved in an area safe from fire and snow breakage and where it will have a long and favorable growing season. In addition, the stock will be accessible for performing experimental work and obtaining resistant tree materials almost year-round, it can be watered to accelerate growth and flowering and can be "farmed" with conventional equipment.

The staff of the new center is composed of the following permanent personnel: (1) R. T. Bingham, Research Forester, In Charge, overall center direction and rust resistance studies, (2) a Research Forester to replace Mr. Squillace, studies on improvement of growth rate and timber quality, (3) J. W. Hanover, Research Forester, flower induction studies and seed orchard technology, (4) D. M. Romans, Forestry Aid, field, arboretum, and nursery work supervision, and (5) Mrs. A. M. Childears, Clerk-Stenographer, secretarial and technician duties. Part of the problem in maintaining a large nursery, greenhouse, and field work program has been solved by appointing a year-round sub-professional nurseryman and field work supervisor (Mr. Romans). It is now evident that another year-round assistant will be required to help handle early and late-season peak work loads and to act as summer field assistant for the man replacing Mr. Squillace. We certainly miss the capable help of Tony Squillace, but

hope to replace him this coming spring.

Rust Resistance Breeding, Progress and Plans for Future Work

Past progeny tests have proved that blister rust resistance is heritable, also that it is transmitted in a fair degree to the first generation seedling progenies of a fair proportion of the rust-free parents or "candidates" under test. Furthermore, those parents which transmit resistance to their progenies often exhibit the feature of general combining ability for rust resistance, as shown by the summarized experimental data which follow.

The four best parents represented in our earliest progeny tests are Nos. 17, 19, 22, and 58. These four parents have been crossed among themselves in all possible combinations (i.e. 17 x 19, 17 x 22, 17 x 58, 19 x 22, 19 x 58, and 22 x 58, or reciprocal crosses), and the six progenies thus produced exposed to blister rust for seven years under conditions of intense artificial and natural rust inoculation. At the end of the test period the six progenies contained proportions of surviving seedlings ranging from 22 to 43 percent, averaging 30 percent. The point is that parents having general combining ability cross among themselves any direction, giving progenies above average in resistance.

Reasoning that such parents are ideally suited for use in seed orchards, that there will be more parents of this type among as yet untested selections, and that seedling progenies averaging 30 percent resistant in an environment of intense rust exposure may prove to be even more resistant under average field conditions, it appears that there is a good chance for putting such parents to practical use in the immediate future. They are already large enough to provide ample scionwood for establishment of grafted seed orchards, the orchards ultimately producing a mixture of semi-resistant progenies like those already tested experimentally above.

Before launching any large-scale F_1 seed orchard program, however, two conditions must be met: (1) the field or practical level of resistance of the better F_1 progenies should be determined, and (2) more parents with general combining ability must be found. Work toward answering both of these questions is underway.

Meanwhile, heritability analyses using our oldest test materials provide encouraging information concerning the probable extent of the increase in resistance accompanying each successive generation of breeding work. These analyses attempt to distinguish environmental and genetic variation, and further to separate genetic variation into additive and non-additive components. They indicate that a good proportion of the variation in resistance exhibited by the first generation progenies is useful in future breeding work (additive), and that the increase in resistance per generation may be as much as 10 to 20 percent.

Thus, we seem to be on the right track, with single, wild-plant selection followed by progeny testing. Orchards to produce tested F_1 progenies may provide stock of immediate usefulness. But at the same time, it becomes imperative to test the predicted gain in the second generation by crossing among F_1 seedling selections and determining the actual gain experienced in the F_2 progenies produced. Depending on success in obtaining early

flowering of F_1 selections now under treatment in the new arboretum, it may require only another ten years for us to produce and test the F_2s. If the predicted gain is realized, then orchards for production of more highly resistant F_2 progenies could also be established immediately, and naturally would be a better investment. Scionwood for the F_2 orchards would come from the then fairly large F_1 parents still held in the Moscow arboretum.

Controlled Pollination Work Expanded

In 1956, field work in searching for rust-resistant parents was one of the major projects. This work produced 126 new canker-free trees, all found in natural white pine stands literally devastated by the rust disease. The new reservoir of germ plasm has remained largely untapped, awaiting confirmation of heritability of rust resistance from initial progeny tests which were still in progress. In the spring of 1958, however, after securing encouraging information from progeny test analyses, we commenced a streamlined crossing program for rapid appraisal of the many new parents.

The program involved selfings and four crosses, one cross being made with each of four "test trees" known for general combining ability for a fairly high level of rust resistance, and selfs and test tree crosses were made on 72 of the 126 new selections, and among the 310 controlled pollinations attempted, it now appears that 297 will be successful. The 1,700-bag program undertaken was over twice as large as any attempted in the past. This was possible because few pollens had to be collected and extracted, because colored plastic tapes were used to code different pollinations, because selfs were made merely by tying male and female flower shoots together in the same pollination bag, and because flowers on the centralized test trees were reserved for use in crosses with trees having only male flowers or involving the greatest amount of travel.

If 1959 proves to be another good flower year, we should be able to complete the 60-odd self and test tree crosses remaining to be made on the 72 trees above, as well as to complete a major part of the same program on the 54 remaining new selections. Depending on the 1959 flowering, we will hold the seed from 1958 cones for 1960 sowing, preferring to establish one large progeny test with progenies from both 1958 and 1959 pollinations at that time.

1958 a Good Seed Year

Altogether some 125 different cone collections were made in 1958. These included: (1) cones coming from six different controlled crossings for mass production of best, pretested F_1 progenies, 375 cones, (2) from 40 crosses made toward establishment of a second, and larger selective fertilization experiment, 634 cones, (3) from 23 test crosses, 346 cones, (4) from five *Pinus monticola* x *P. lambertiana* hybrid crosses, 105 cones, (5) from 47 different open-pollinated lots of untested parents, 589 cones, and (6) from four non-resistant control lots, 140 cones.

The laborious job of extracting, cleaning, and removing hollow seed from these 2,200 cones has just been completed by our secretary-technician, Mrs. Childears. Normal, sound seed yields were up to expectation in all but five of the 125 cone lots. These five lots were the hybrid lots which produced over 6,000 hollow seed, but only three sound seed.

More F_1 Seedlings Established in Moscow Arboretum

Another 140 F_1 seedlings, selected for survival after several years exposure to intense artificial and natural rust inoculation, were lifted and

balled on the field progeny test plots, artificially inoculated once more, and transplanted in the new arboretum. At present, about 18 of the 40 acres there are planted to selected, resistant F_1 seedlings and other experimental trees. As mentioned above, this is our stock for second generation and backcross breeding toward increased rust resistance.

Flower Induction Work Yields Some Tentative Results

Work in flower induction, as commenced in 1951 and expanded by Mr. Squillace in 1955 and 1956, includes top-grafting in mature (flowering trees, grafting on hybrid rootstocks, fertilizing of almost-mature and mature trees in natural stands, and fertilizing-watering-cultivating of immature and almost-mature trees in natural and planted stands. Top-grafting to secure transmission of the flowering stimulus from a mature rootstock to a seedling scion seems to hold little more promise for securing early flowering than does growing the seedling on its own roots and giving it "the works" in respect to fertilizing, cultivating, and watering. Seedlings top-grafted into flowering trees are beginning to flower at ages between eight and eleven years. At the same time, six- and seven-year-old seedlings on their own roots, fertilized for two years in the nursery, and merely cultivated on field plots for another four or five years, as well as nine-year-old seedlings, cultivated, watered, and fertilized for the last two seasons, began flowering.

Work in Seed Orchard Techniques Started

Mr. Hanover has assumed direction of all work in flower induction and seed orchard technology. Besides the flower induction work mentioned above, his present program also includes work on a pilot-scale seed orchard.

The pilot-scale orchard, 17.3 acres, at the Sandpoint Ranger Station, is a cooperative project of the Genetics Center, Timber Management, R-1, and the Kaniksu National Forest. Timber Management is providing nursery stock and funds for establishment and maintenance of the orchard, the funds being administered by the Kaniksu National Forest. The Genetics Center is providing scionwood of promising resistant parents, greenhouse space for making grafts, and technical direction for making of grafts and the establishment and maintenance of the orchard. At present, our small greenhouse is bulging with more than 3,000 white pine seedlings provided by Savenac Nursery and potted by the center staff. Scionwood of twelve promising parent trees was collected by the center staff in early December 1958, and is now being held packed in snow in a deepfreeze. Beginning in mid-January, and with the help of Foresters John Chapman, Ted Peterson, and John Hook of the St. Joe, Kaniksu, and Clearwater National Forests, respectively, we will commence making 3,000 bottle grafts. These grafts will remain in the greenhouse until all danger of frost is past, then will be moved to the lathhouse and held there until planting time in the spring of 1960.

The proposed Sandpoint pilot-scale seed orchard has three objectives. These are: (1) to determine the practical problems encountered in production, establishment, treatment and maintenance of grafted white pine seed orchards, (2) to provide another "archives" for preserving elite, rust-resistant materials, and (3) to obtain some volume production of tested, partially resistant F_1 seed at a time earlier than heretofore anticipated. Realization of Objective 3 above depends on the level of field resistance in selected F_1 progenies being at least as great as already determined for them experimentally.

By R. T. Bingham, Research Forester

Northern Idaho Forest Genetics Center, Moscow, Idaho: Administration and laboratory building.

Northern Idaho Forest Genetics Center: Greenhouse, laboratory, lathhouse, and experimental nursery facilities.

VIII. MECHANICAL DEVELOPMENTS FOR WHITE PINE BLISTER RUST CONTROL, 1958

Acti-dione Sprayer

A light-weight 10½-pound, 2-gallon capacity, back-pack sprayer was made from aluminum. The pilot model is the compressed air type. It was extensively field tested and its performance was satisfactory.

The development was undertaken because: Oil sprays do not work well in compressed air hand sprayers. Extra screens, dust caps, and pump guards must be provided to insure their continuous operation. A pack board is required for the larger models. Pump leathers and check valves need replacing often on the air pumps encased in the spray tanks.

The cost of the handmade welded aluminum back-pack sprayer was $318.34. Forty-one hours of shop labor were needed for its completion.

If this quality of sprayer is considered necessary for future BRC canker control, low costs of quantity numbers can be reached by sand casting the aluminum heads and recessing and sealing the tubes at the ends with O-ring gaskets.

Quick-Mount Power Truck Sprayer

A compact, short-piped, easily-serviced power sprayer was constructed through the initiative and financing of the Coeur d'Alene Forest. Agitation by hydraulic overflow from the pump was employed in place of the usual chain or belt driven paddles. The unit is mounted on wooden skids for rapid transfer to other conveyors or storage shed.

The assembly was completed at the Spokane Forest Service Engineering Shop at a cost of $789.50.

Field performance of the quietly running machine was excellent. It is easily serviced and accompanying crew delays are held to a minimum.

Parks Portable Sprayer

The production of a small carryable power sprayer with performance near that of a truck-mounted unit has been the objective in this development for the National Parks.

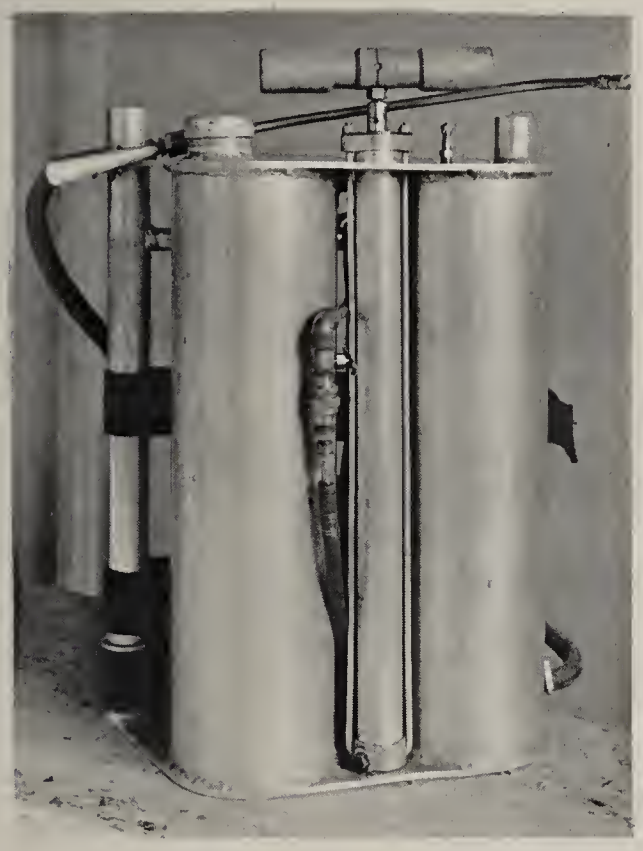
Many trials have resulted in the improvements on bases, relief controls, engine horsepower, and pump impellers and cams.

The pumper illustrated represents a machine that has given satisfactory service to BRC crews in 1958. Cost of a single unit as indicated is $250, or when ordered in lots of five or more, the price each is $225.

By John F. Breakey, Mechanical Engineer

1.

ACTI-DIONE SPRAYER

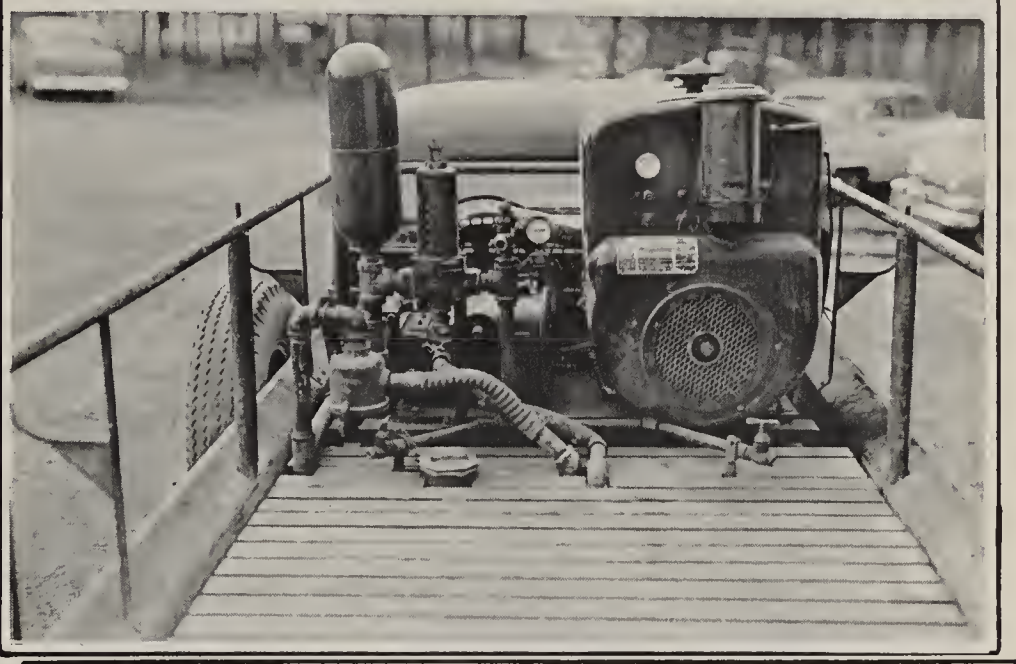


REAR VIEW

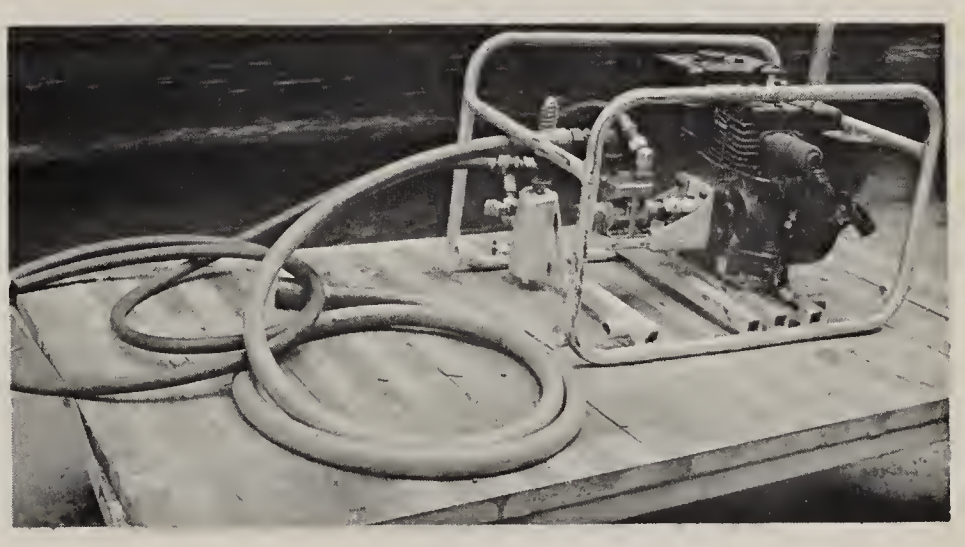
FRONT VIEW

2.

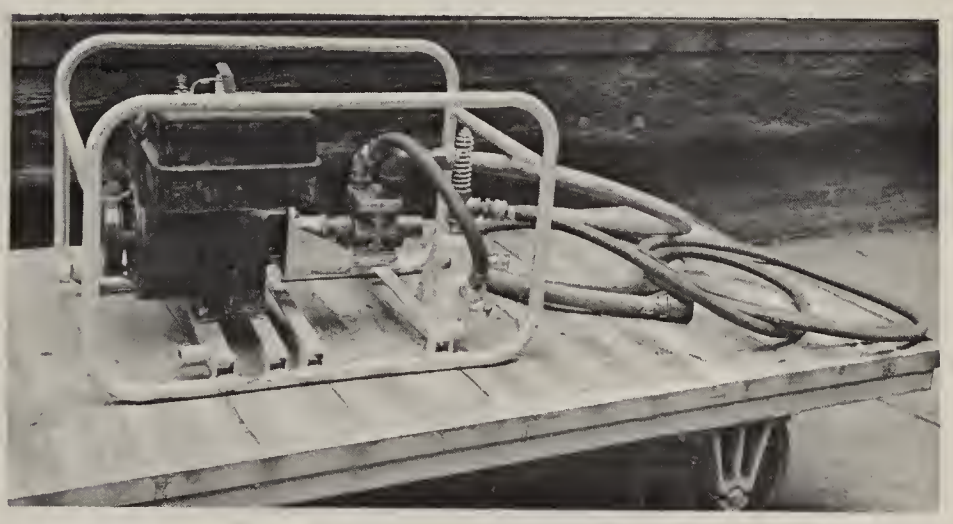
QUICK MOUNT POWER TRUCK SPRAYER



3. PARKS PORTABLE SPRAYER



LEFT SIDE VIEW



RIGHT SIDE VIEW

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A PROGRESS REPORT ON

THE TREATMENT OF BLISTER RUST TRUNK CANKERS

ON WESTERN WHITE PINE WITH ACTI-DIONE

ON A PROJECT BASIS

KANIKSU NATIONAL FOREST

1958

Prepared by:

Blister Rust Control Personnel
Kaniksu National Forest

THE TREATMENT OF BLISTER RUST TRUNK CANKERS ON WESTERN WHITE PINE WITH ACTI-DIONE ON A PROJECT BASIS

INTRODUCTION

The antibiotic "Acti-dione" was first tested on white pine blister rust trunk cankers in 1953.[1/] Subsequent work has resulted in the improvement of both chemical formulations and methods of spray application.[2/] Early treatment involved pruning lower limbs; removing bark from inside the margin of discoloration, and applying Acti-dione, with a small paint brush, to the excised surface of cankers. By 1956, tests had definitely established the fact that Acti-dione was 100 percent effective if properly applied to a trunk canker. To facilitate treatment, the small paint brush originally used in applying Acti-dione solution to trunk cankers was replaced by a quart-size compression sprayer.

On the basis of the encouraging results obtained in experimentation, the Kaniksu National Forest blister rust control project established work plans for the 1957 field season for the treatment of trees on a project basis.[3/] Of the 20,000 trees inspected in 6 plantations, 3,500 trees were treated with Acti-dione. Both the excise and slit methods were used depending upon the size of trunk cankers. The Acti-dione stove oil solution was applied by a Hudson compression sprayer of two-gallon capacity.

In 1958, the Kaniksu National Forest expanded the Acti-dione project by treating 135,000 trees in 4 plantations. Until the first of August, the slit method was used in treating unpruned trees. Thereafter, the basal stem spray method was employed. Trees are not examined for infection or bark cut to facilitate spray penetration in this new method. Instead, all potential crop trees are treated whether healthy or diseased providing foliage is of normal color and growth.

It has been found that diseased white pine which can be saved should contain at least one-third the trunk circumference of living bark, and the needles should not be chlorotic or dwarfed.

1/ Moss, Virgil D., 1957, "Acti-dione Treatment of Blister Rust Trunk Cankers on Western White Pine" in the Plant Disease Reporter 41(8), p. 709.

2/ Moss, Virgil D., 1958, "Acti-dione Stove Oil Treatment of Blister Rust Trunk Cankers on Reproduction and Pole Western White Pine" in the Plant Disease Reporter 42(5), p. 703.

3/ Henry J. Viche and Frank J. Kapel., 1957, "A Progress Report on the Treatment of Blister Rust Trunk Cankers on Western White Pine with Acti-dione on a Project Basis" in the Kaniksu National Forest Blister Rust Project Report, p. 10, illus.

Areas Selected

Acti-dione work was performed in 4 plantations characterized as follows:

1. Upper Lamb and Bath Creeks. Western white pine was planted in 1941. With over 50 percent infection, fill-in planting would have been necessary to keep area adequately stocked in the future. Accessibility was poor with only one ridge road between the two drainages. Heavy alder patches were common making travel difficult. Area has fair to excellent sites on south and north exposures. Groups of white pine 8 inches in diameter and 30 feet high grow on the better sites. The Acti-dione project was carried out concurrently with ribes eradication work. Both crews used the same standard grid system of lots and lanes, and worked out of the same camp.

2. Pelke. Western white pine was planted in 1954 on a 28-acre clearcut and broadcast burn area. Trees are about 3 feet high. Area contains little ground cover or brush. The plantation is readily accessible by a road passing through the area and is within one-half mile of a forest work center.

3. South Baldy. Western white pine was planted in 1948. On an eastern exposure, area has an elevation of 4,800 feet. Trees average 6 to 8 feet in height. Present stocking is good but stand is about 50 percent infected. The area contains no brush and is easily accessible by road.

4. Cuban Hill. A pure stand of western white pine planted in 1932 lays adjacent to Idaho State Highway No. 57. The stand occupies a moderate to steep north slope at an elevation of 2,400 to 2,800 feet. Present stocking is good except along a ridge where it is very patchy in association with Ceanothus. The 1954 pine disease survey found the plantation was 30 percent damaged by blister rust from heavy infections occurring in 1937, 1941, and 1947.

Operation Procedure

All healthy and diseased crop trees were treated by the basal-stem spray method. This eliminated two steps of the excise and slit methods; namely, (1) examining trees for infection, and (2) treatment of individual cankers. The dragline method and the standard grid system of lots and lanes as in ribes eradication was used in Acti-dione work. Two draglines were laid alternately by a crewman to mark the area as he worked his way across a lane. The mechanical procedure of working an area was as follows:

1. With spray can in hand, a crewman laid out his draglines across a lane. The width between draglines varied from 1/2 to 1 chain depending upon the number, spacing, and size of trees, and the amount of brush.

2. The crewman then worked back between draglines spraying all potential white pine crop trees, healthy or infected, keeping count of the trees sprayed.

3. Upon completing a strip, he recorded the number of trees sprayed in his lot report book; filled spray can if necessary from a 5-gallon jeep can kept abreast with the crewman's progress, then moved to next unworked strip and continued above procedures.

Basal Stem Spray Method

In applying Acti-dione solution from opposing sides of a trunk, the nozzle of the spray pump is held 12 to 18 inches from the tree to wet the basal portions of trunk and branches. Basal portion of lower branches are wet 18 inches from axils. Trees 10 feet or less in height are sprayed from base to 1/3 their height. Trees over 10 feet tall are sprayed to a height of about 5 feet but not exceeding 1/3 the crown length.

Records

The lot report used in ribes eradication work is adaptable for Acti-dione treatment. The crewman records the number of trees treated by drag, man-hours, and gallons of chemical (Figure 1). This information is then transfered to the lot map (Figure 2).

Figure 1. Sample Lot Report

M-1911-R1

LOT REPORT

Crewman John Doe Lane 11 Lot 7

ERADICATION						STR.	RIBES LOCATION
Date	Hrs.	TREES ~~Lac.~~	Vis.		Wrk.	NO TREES	Working South
9-2	6	654				102	
						103	
						95	==========
						205	
						149	
							Complete
Total	6	654					

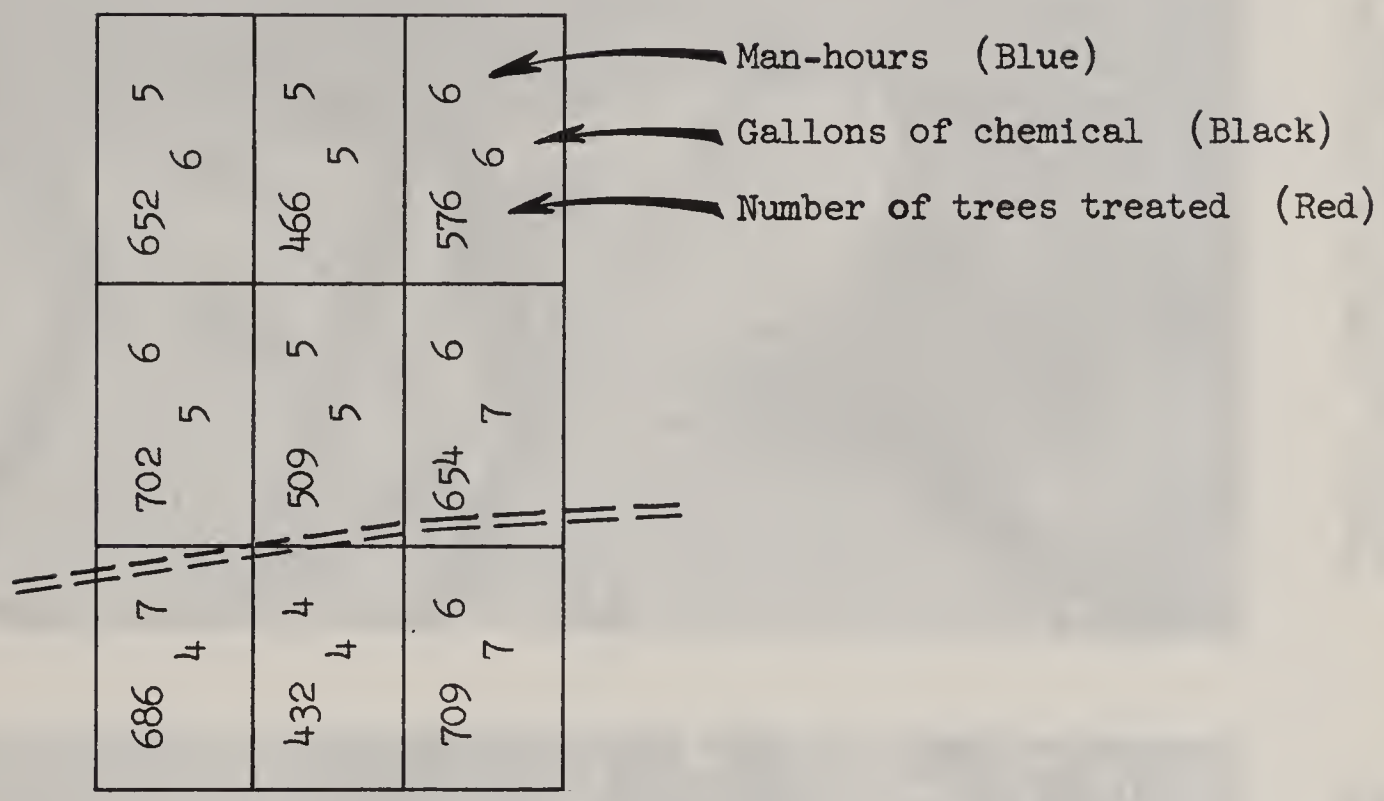
Checker

CHECKING

Date	Lac.	Vis.		Check
Total				

Gallons Chemical 7

Figure 2. Sample of Lot Map



LEGEND

========== Secondary road

BATH CREEK

S34 T36N R45E

Age Class 1941-50

Figure 3. Shows premature casting of needles from western white caused by Acti-dione spray from basal stem treatment made in June. Picture was taken the following October.

Figure 4. Canker four months after treatment with Acti-dione by basal stem spray method. Note sharp contrast between dead canker and surrounding live trunk bark.

Figure 5. Shows canker dead one year after Acti-dione treatment. Note dead bark cracking at base of trunk from constriction and new wood invading canker area.

Figure 6. Shows canker two years after Acti-dione treatment. Note new wood callusing around scar perimeter.

RESULTS AND DISCUSSION

Acti-dione treatment of western white pine stands to preserve adequate stocking from trees infected by blister rust must be done on a priority basis Basic factors in determining stand priority are:

1. Age of stand.
2. Amount of infection.
3. Time until stocking is seriously reduced by the rust.

Small diameter trees are killed more quickly by rust than large diameter trees. Young stands, therefore, need earlier treatment than older stands to maintain adequate stocking. However, immature merchantable timber will yield a higher return on the cost of Acti-dione treatment because of earlier harvest.

The efficiency of the Acti-dione program has increased greatly since the introduction of the basal stem spray method of treatment compared to the older excise and slit methods. The newer method of application kills bole cankers in all sizes of immature western white pine as effectively as the excise and slit methods. All potential white pine crop trees were treated by the new method for the following reason:

All crop trees in a stand can be treated at less cost than if only diseased crop trees are treated because searching time in examining trees for infection is eliminated. As proof, table 1 shows there were 75 trees treated per man-day by the slit method compared to 458 trees treated per man-day by the basal stem spray method in the Upper Lamb Creek and Bath Creek Plantation; and the slit method required 1.17 man-days per acre compared to 0.79 man-days per acre by the basal stem spray method.

Cost of the Acti-dione treatment has also been reduced by the introduction of the basal stem spray method. Again using the Upper Lamb Creek and Bath Creek Plantation as the largest example, the total cost per treated tree was $0.195 by the slit method compared to $0.045 by the basal stem spray method; and the total cost per acre was $17.00 by the slit method compared to $14.46 by the basal stem spray method.

In the past there has been a great deal of trouble with pumps clogging and parts wearing out. This has resulted in loss of much working time. Daily production could be increased if a trouble-free spray pump was available.

As the Acti-dione program expands, one man using 8 to 10 gallons of chemical each day will present a field supply problem. This problem will require the utmost in planning to get the job done efficiently on all types of areas.

For large-scale programs, the Acti-dione stove oil solution should be mixed in large quantities to facilitate supplying the workers. It would, therefore, be advantageous to obtain the Acti-dione concentrate in large containers.

The Acti-dione solution causes premature casting of the second and third year needles. However, this makes for better natural pruning and reduces needle target area for subsequent blister rust infection.

Table 1. Results of the Acti-dione treatment on western white pine in the Kaniksu National Forest during 1958 using the slit and basal stem spray methods. Cost figures are based on a wage rate of $14.00 per man-day and $0.835 per gallon of solution. * Proportion of trees treated to trees inspected and treated.

Location and Age Class	Method of Treatment	Number of Trees Treated	Man-days	Acres	Gallons of Chemical	Trees Treated Per Man-day	Man-days Per Acre	Trees Treated Per Gallon of Solution (4 oz. Acti-dione to 10 gals. Stove Oil	Number of Trees Treated Per Acre	Gallons Per Acre	Labor Cost Per Treated Tree	Chemical Cost Per Treated Tree	Total Cost Per Treated Tree	Labor Cost Per Acre	Chemical Cost Per Acre	Total Cost Per Acre
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Upper Lamb Creek and Bath Creek	slit	*23,260 / 43,064	312	266.5	195	74.6	1.17	119.3	87.0	0.73	$0.188	$0.007	$0.195	$16.39	$0.61	$17.00
Age Class 1941-50	basal	66,374	145	183.0	740	457.8	0.79	89.7	362.7	4.04	0.036	0.009	0.045	11.09	3.37	14.46
Pelke Age Class 1951-60	basal	10,744	13	28.0	64	826.5	0.46	167.9	383.7	2.29	0.017	0.005	0.022	6.50	1.91	8.41
South Baldy Age Class 1941-50	basal	5,053	7	6.3	63	721.9	1.11	80.2	802.0	10.00	0.019	0.010	0.030	15.56	8.35	23.91
Cuban Hill Age Class 1921-40	slit	* 1,500 / 1,850	25	40.0	18	60.0	0.62	83.3	38.0	0.45	0.233	0.010	0.243	8.75	0.38	9.13
	basal	28,163	89	135.1	5	316.4	0.66	63.3	208.5	3.29	0.044	0.013	0.057	9.24	2.75	11.99
Total slit		24,760	337	306.5	3	73.0	1.10	116.	81	.69	0.191	0.007	0.198	15.40	0.58	15.98
Total basal		110,334	254	352.4	1,312	434.0	0.72	84.	313	3.72	0.035	0.010	0.045	11.09	3.03	14.12
Grand Total		135,094	591	658.9	1,525	229.0	0.90	88.5	205	2.31	$0.064	$0.009	$0.073	$13.10	$1.89	$14.99

SUMMARY

Many advances have been made in methods of applying Acti-dione to western white pine infected by blister rust since first testing this antibiotic in 1953. These advances have been responsible for treating an increasing number of trees each year. On the Kaniksu National Forest in 1958, over 110,000 western white pine trees on 350 acres were treated by the basal stem spray method.

Average cost by the basal stem spray method was 4.5¢ per tree and $14.12 per acre. Cost of treatment was proportional to the size of trees, accessibility of area, amount of ground covered, and number of trees per acre.

Stands within blister rust control units needing Acti-dione treatment, to preserve adequate stocking, should be worked on a priority basis.

The Acti-dione program has possibilities of saving many blister rust infected western white pine stands which would otherwise be lost. Also, long-term protection of stands may result if the antibiotic immunizes trees against new rust infection. This phase of disease prevention is being currently studied.

R-1-NL

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

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A PROGRESS REPORT ON

THE TREATMENT OF BLISTER RUST TRUNK CANKERS

ON WESTERN WHITE PINE WITH ACTI-DIONE

ON A PROJECT BASIS

KANIKSU NATIONAL FOREST

1958

Prepared by:

Blister Rust Control Personnel
Kaniksu National Forest

M—5123 U. S. GOVERNMENT PRINTING OFFICE 8—7417

THE TREATMENT OF BLISTER RUST TRUNK CANKERS ON WESTERN WHITE PINE WITH ACTI-DIONE ON A PROJECT BASIS

INTRODUCTION

The antibiotic "Acti-dione" was first tested on white pine blister rust trunk cankers in 1953.[1/] Subsequent work has resulted in the improvement of both chemical formulations and methods of spray application.[2/] Early treatment involved pruning lower limbs; removing bark from inside the margin of discoloration, and applying Acti-dione, with a small paint brush, to the excised surface of cankers. By 1956, tests had definitely established the fact that Acti-dione was 100 percent effective if properly applied to a trunk canker. To facilitate treatment, the small paint brush originally used in applying Acti-dione solution to trunk cankers was replaced by a quart-size compression sprayer.

On the basis of the encouraging results obtained in experimentation, the Kaniksu National Forest blister rust control project established work plans for the 1957 field season for the treatment of trees on a project basis.[3/] Of the 20,000 trees inspected in 6 plantations, 3,500 trees were treated with Acti-dione. Both the excise and slit methods were used depending upon the size of trunk cankers. The Acti-dione stove oil solution was applied by a Hudson compression sprayer of two-gallon capacity.

In 1958, the Kaniksu National Forest expanded the Acti-dione project by treating 135,000 trees in 4 plantations. Until the first of August, the slit method was used in treating unpruned trees. Thereafter, the basal stem spray method was employed. Trees are not examined for infection or bark cut to facilitate spray penetration in this new method. Instead, all potential crop trees are treated whether healthy or diseased providing foliage is of normal color and growth.

It has been found that diseased white pine which can be saved should contain at least one-third the trunk circumference of living bark, and the needles should not be chlorotic or dwarfed.

1/ Moss, Virgil D., 1957, "Acti-dione Treatment of Blister Rust Trunk Cankers on Western White Pine" in the Plant Disease Reporter 41(8), p. 709.

2/ Moss, Virgil D., 1958, "Acti-dione Stove Oil Treatment of Blister Rust Trunk Cankers on Reproduction and Pole Western White Pine" in the Plant Disease Reporter 42(5), p. 703.

3/ Henry J. Viche and Frank J. Kapel., 1957, "A Progress Report on the Treatment of Blister Rust Trunk Cankers on Western White Pine with Acti-dione on a Project Basis" in the Kaniksu National Forest Blister Rust Project Report, p. 10, illus.

METHODS

Areas Selected

Acti-dione work was performed in 4 plantations characterized as follows:

1. Upper Lamb and Bath Creeks. Western white pine was planted in 1941. With over 50 percent infection, fill-in planting would have been necessary to keep area adequately stocked in the future. Accessibility was poor with only one ridge road between the two drainages. Heavy alder patches were common making travel difficult. Area has fair to excellent sites on south and north exposures. Groups of white pine 8 inches in diameter and 30 feet high gfow on the better sites. The Acti-dione project was carried out concurrently with ribes eradication work. Both crews used the same standard grid system of lots and lanes, and worked out of the same camp.

2. Pelke. Western white pine was planted in 1954 on a 28-acre clearcut and broadcast burn area. Trees are about 3 feet high. Area contains little ground cover or brush. The plantation is readily accessible by a road passing through the area and is within one-half mile of a forest work center.

3. South Baldy. Western white pine was planted in 1948. On an eastern exposure, area has an elevation of 4,800 feet. Trees average 6 to 8 feet in height. Present stocking is good but stand is about 50 percent infected. The area contains no brush and is easily accessible by road.

4. Cuban Hill. A pure stand of western white pine planted in 1932 lays adjacent to Idaho State Highway No. 57. The stand occupies a moderate to steep north slope at an elevation of 2,400 to 2,800 feet. Present stocking is good except along a ridge where it is very patchy in association with Ceanothus. The 1954 pine disease survey found the plantation was 30 percent damaged by blister rust from heavy infections occurring in 1937, 1941, and 1947.

Operation Procedure

All healthy and diseased crop trees were treated by the basal-stem spray method. This eliminated two steps of the excise and slit methods; namely, (1) examining trees for infection, and (2) treatment of individual cankers. The dragline method and the standard grid system of lots and lanes as in ribes eradication was used in Acti-dione work. Two draglines were laid alternately by a crewman to mark the area as he worked his way across a lane. The mechanical procedure of working an area was as follows:

1. With spray can in hand, a crewman laid out his draglines across a lane. The width between draglines varied from 1/2 to 1 chain depending upon the number, spacing, and size of trees, and the amount of brush.

2. The crewman then worked back between draglines spraying all potential white pine crop trees, healthy or infected, keeping count of the trees sprayed.

3. Upon completing a strip, he recorded the number of trees sprayed in his lot report book; filled spray can if necessary from a 5-gallon jeep can kept abreast with the crewman's progress, then moved to next unworked strip and continued above procedures.

Basal Stem Spray Method

In applying Acti-dione solution from opposing sides of a trunk, the nozzle of the spray pump is held 12 to 18 inches from the tree to wet the basal portions of trunk and branches. Basal portion of lower branches are wet 18 inches from axils. Trees 10 feet or less in height are sprayed from base to 1/3 their height. Trees over 10 feet tall are sprayed to a height of about 5 feet but not exceeding 1/3 the crown length.

Records

The lot report used in ribes eradication work is adaptable for Acti-dione treatment. The crewman records the number of trees treated by drag, man-hours, and gallons of chemical (Figure 1). This information is then transfered to the lot map (Figure 2).

Figure 1. Sample Lot Report

M-1911-R1

LOT REPORT

Crewman John Doe Lane 11 Lot 7

ERADICATION						STR.	RIBES LOCATION
Date	Hrs.	TREES ~~Lac.~~	Vis.		Wrk.	NO TREES	Working South
9-2	6	654				102	
						103	
						95	==========
						205	
						149	
							complete
Total	6	654					

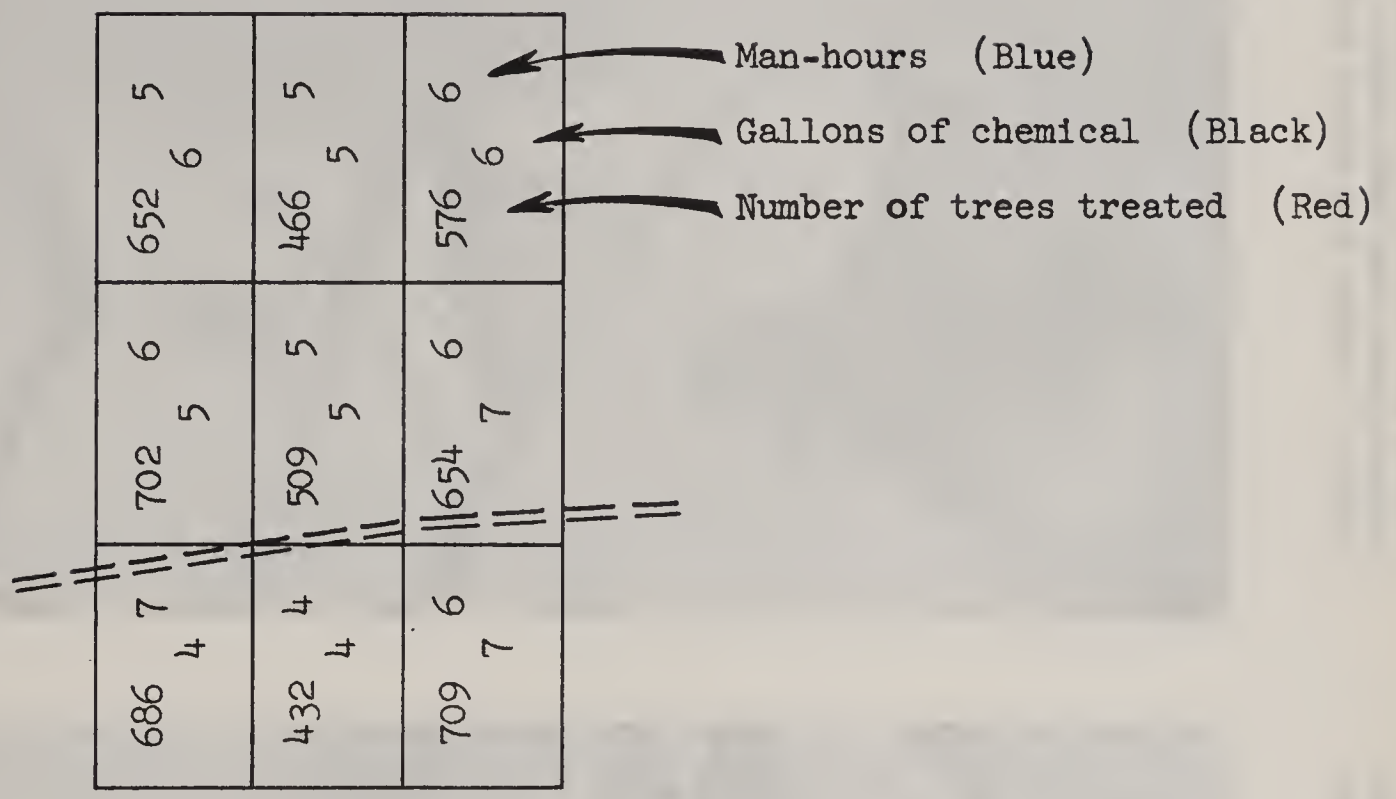
Checker

CHECKING

Date	Lac.	Vis.		Check
Total				

Gallons Chemical 7

Figure 2. Sample of Lot Map



LEGEND

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S34 T36N R45E

Age Class 1941-50

Figure 3. Shows premature casting of needles from western white caused by Acti-dione spray from basal stem treatment made in June. Picture was taken the following October.

Figure 4. Canker four months after treatment with Acti-dione by basal stem spray method. Note sharp contrast between dead canker and surrounding live trunk bark.

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RESULTS AND DISCUSSION

Acti-dione treatment of western white pine stands to preserve adequate stocking from trees infected by blister rust must be done on a priority basis. Basic factors in determining stand priority are:

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Location and Age Class	Method of Treatment	(2) Number of Trees Treated	(3) Man-days	(4) Acres	(5) Gallons of Chemical	(6) Trees Treated Per Man-day	(7) Man-days Per Acre	(8) Trees Treated Per Gallon of Solution (4 oz. Acti-dione to 10 gals. Stove Oil	(9) Number of Trees Treated Per Acre	(10) Gallons Per Acre	(11) Labor Cost Per Treated Tree	(12) Chemical Cost Per Treated Tree	(13) Total Cost Per Treated Tree	(14) Labor Cost Per Acre	(15) Chemical Cost Per Acre	(16) Total Cost Per Acre
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Many advances have been made in methods of applying Acti-dione to western white pine infected by blister rust since first testing this antibiotic in 1953. These advances have been responsible for treating an increasing number of trees each year. On the Kaniksu National Forest in 1958, over 110,000 western white pine trees on 350 acres were treated by the basal stem spray method.

Average cost by the basal stem spray method was 4.5¢ per tree and $14.12 per acre. Cost of treatment was proportional to the size of trees, accessibility of area, amount of ground covered, and number of trees per acre.

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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

A N N U A L R E P O R T

ON

THE CONTROL OF WHITE PINE BLISTER RUST

IN CALIFORNIA

FOR THE CALENDAR YEAR 1958

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
CALIFORNIA REGION
1958

M—5123

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THE BLISTER RUST CONTROL PROGRAM - 1958

By

Neil J. MacGregor, BRC Officer

White pine blister rust, a fungus-caused disease which was introduced into North America from Europe about 1900, is now widespread throughout Northern California and is epidemic on thousands of acres in the northwest portion of the State.

The disease fatally attacks all white pines and seriously threatens the continued production of sugar pine, one of California's most valuable timber species. Endangered white pines other than sugar pine are western white pine, whitebark pine, limber pine, foxtail pine, and bristlecone pine. These species are of value principally for recreational, aesthetic, and scientific purposes. Control of the disease is accomplished chiefly through the eradication of wild gooseberry and currant bushes from selected control areas. These plants are alternate hosts for the rust. Their elimination interrupts the life cycle of the parasite and prevents infection of the white pines. Control is undertaken on the lands of private timber producers as well as on State and Federal forests and parks.

Blister rust control in California is a cooperative program involving the California Division of Forestry, the California Division of Beaches and Parks, the University of California, the National Park Service, the U. S. Forest Service, and many representatives of the State's forest industry.

Over-all leadership, technical direction, and coordination is provided by the Forest Service. The State of California through its continued interest and substantial financial support makes possible the protection of many of the finest privately owned sugar pine stands in the West. Several private cooperators make voluntary financial contributions for work on their lands. The selection of control units in noncommercial forests is the responsibility of State and Federal park officials. The National Park Service with the technical assistance of the Forest Service conducts extensive control projects in all national parks within the State. The Forest Service, of course, has active control projects on all national forests within the commercial range of sugar pine.

Almost half of the commercial timber producing area now included in sugar pine management units is in State and private ownership. Blister rust control work on these lands is financed cooperatively. The State assumes full financial responsibility for work on its lands and matches Federal appropriations and private contributions for work on privately owned land. Individual owners are encouraged to contribute up to 25 per cent of control on their holdings. The financing available for the program in fiscal year 1959 is given in the following table:

BLISTER RUST CONTROL FINANCING
FISCAL YEAR 1959

State of California	Federal Allotments				Total
	State and Private Lands	National Forest Lands	National Park Lands	Technical Direction	
$115,000	$45,000	$282,000	$110,736	$89,000	$641,736

RUST SPREAD IN CALIFORNIA

Conditions favorable for appreciable rust buildup on pine occurred generally throughout the Northern Sierra, Southern Cascade and Siskiyou Ranges this year. The extent to which actual intensification of the disease took place cannot be determined as yet since several years' growth are necessary before new cankers are visible.

The general rust situation in the State remains substantially unchanged. In the northwest where the most favorable conditions for rust development are found and where the disease has been established the longest, blister rust is now widespread, and heavy losses to sugar pine in all size classes are being inflicted. In many localities sugar pine is now being eliminated from the forest. In the Northern Sierra and Southern Cascade intensification is rapid, but more local. Infection centers in which one-third to one-half of the white pines are infected are not uncommon. Although the disease is much less widely distributed in the Central Sierra, individual centers are displaying considerable activity.

The southernmost known penetrations of the disease remain the infection centers at Dodge Ridge (Tuolumne County) in the Sierra and Elder Creek (Tehama County) in the Coast Range. 1958 appears to have been a poor year for long distance spread in the Sierra. Scouting parties in Yosemite Park and the south-central forests found less pinyon rust than usual and discovered no new infection centers.

THE STATE COOPERATIVE AND NATIONAL FOREST PROJECTS

Protection of the commercial sugar pine resource of California from blister rust is the principal objective of both the State Cooperative and the National Forest Projects. The economic production of high quality sugar pine is the principal basis for control unit selection. Sugar pine management units at present include 213,000 acres of State and private land and

264,000 acres of Federal land. Blister rust control work on both projects is administered by national forest personnel. Staff assistance and technical direction are provided by California Division of Forestry and Regional Office personnel.

RIBES ERADICATION

The ribes eradication program remained comparatively unchanged from previous years. Most of the work was performed by private contractors. Nearly one-third was initial eradication, reeradication accounting for the bulk of the remaining acreage. Contract prices were about 25 per cent lower than during the past two years. The herbicide, 2,4-D, in pellet form proved effective for eradicating concentrations of post-logging ribes and for the treating of crown sprouts which result from the standard spray application of the chemical.

The modified scale of re-inspection charges for contract checking, which was developed on the Lassen operation in 1957, was also used on the Sierra operation this year. The system makes a charge for the second and all subsequent inspections and varies the charge according to the contract specification. (More rigid specifications require more intensive inspection.) The primary objective of the new scale is to reduce the amount of rechecking.

DIRECT CONTROL

Control of blister rust through sanitation pruning continues to occupy a small but significant place in the over-all program. This treatment consists of a careful examination of infected stands and the removal of lethal branch cankers. At present only trees without infection in the bole can be saved in this way. Direct control is used as a supplementary measure only, and ribes eradication within the infected stand remains the principal means of control.

Field testing of the fungicide, Acti-dione, was continued this year. Tentative results indicate that the chemical shows promise of useful application in connection with sanitation pruning. Further work on dosage and technique is required. Methods development work in this field will be initiated in 1959 by the California Forest and Range Experiment Station.

SURVEYS

As in past years ribes surveys (checking) made up the major part of the over-all surveys program. A total of 100,000 acres were sampled. Contract inspection accounted for better than half of the job. Other survey accomplishments include 22,000 acres of sugar pine delineation and a small amount of disease survey work.

A four-day field conference and training meeting devoted largely to wide-strip techniques and the problems of maintenance work was held in the fall. California Division of Forestry personnel and representatives from most blister rust forests attended.

RUST-RESISTANT SUGAR PINE

Although the rust-resistant sugar pine program in California is still largely in its preliminary stages, substantial progress was made this year in several fields.

1. The search for resistant trees was continued and an additional 28 were found, bringing the total number to 82. This represents the accomplishment of a preliminary objective of the program. Until equal progress has been made in other fields, no further search for resistant material will be made.

2. All of the most promising accessible resistant trees found prior to 1958 have received initial release and fertilization. Additional release in progressive stages is planned for some trees, and a tentative two-year fertilization schedule has been adopted.

3. Scion material from 25 trees has been collected and has been grafted onto 200 potted seedlings. Results to date have been disappointing. Future grafting will be done at the Placerville Nursery where more suitable climate and growing stock should produce better results. Plans call for the use of 1-2 stock in the transplant beds as well as potted material. Some of the grafted material has been moved to the State nursery at Magalia.

4. The California Forest and Range Experiment Station continued tests of various vegetative reproduction methods, but with little success as yet.

5. The rust-resistant pine project has been incorporated into the broader forest genetics program to be conducted by the Eldorado National Forest at the newly established Placerville Nursery. A new position allowing full-time attention to genetics and nursery problems has been created and filled. Construction will soon begin on a lath house at the nursery for rust-resistant work.

6. Several possible outplanting sites for resistance testing and archive purposes have been selected. The final choice will be made next year, and work on necessary facilities, fencing, water supply, etc. will be begun.

7. Immediate-objective plans have been made for the bagging of all wind-pollinated cones in the spring of 1959 and for the production of hybrid F_1 progeny as soon as possible.

THE NATIONAL PARK PROJECT

The National Park Project entered its second quarter century of operation in 1958. In the summer of 1933 a 50-man crew from CCC camps in Yosemite Park began initial ribes eradication in the Hazel Green area of that Park. Today, as a result of 25 years of intensive ribes eradication, about 160,000 acres of outstanding sugar pine, western white pine, whitebark pine, and foxtail pine are protected from blister rust. This goal has been achieved at the cost of about 300,000 seasonal man days and has resulted from the destruction of nearly 40 million gooseberry and currant bushes.

The present status of control in the national parks is encouraging. Virtually all control unit acreage has received at least two eradications and about three quarters is in maintenance status. Some initial work remains to be done, and a few troublesome areas will require considerable additional attention, but the major job is substantially complete. Current status is summarized in the following table:

CURRENT STATUS OF BLISTER RUST CONTROL ON
NATIONAL PARK LANDS IN CALIFORNIA

Park	Initial Ribes Eradication Complete	Percentage of Control Acreage On Maintenance
Lassen	97%	69%
Yosemite	96%	66%
Sequoia-Kings	95%	84%
Total	96%	72%

With the accomplishment of these initial objectives the control program is entering a new phase. Until recently major emphasis has been on the mass destruction of dense ribes concentrations with the objective of bringing these populations under ecological control at a level that would provide protection from blister rust. As these conditions were met, areas were classified as being on maintenance. Attention is now shifting to the problems presented by the sizable and rapidly increasing maintenance acreage.

The general outline of the blister rust control program under these conditions is as follows: (1) The basic objective is maintaining control rather than achieving it. (2) The major job is locating areas requiring work rather than removing ribes. (3) Personnel requirements have shifted from

the need for a massive unskilled work force to a small, highly skilled, closely supervised one. Specific differences include a longer treatment cycle, a lower annual expenditure, a combining of the inspection and eradication activities, and a need for seasonal employees of the highest available calibre.

The main changes in recent years are the development of survey and eradication methods which are better suited to maintenance conditions and a re-assessment of the long-range work plans for Yosemite and Sequoia-Kings Canyon Parks.

LASSEN VOLCANIC NATIONAL PARK

During the 1958 field season about 700 acres were worked in Lassen Park. The bulk of this was initial work in the Little Hot Springs area and was performed mostly by private contractors. Because of the difficult working conditions in this area and the unusually late snow situation, bid prices were high and completion dates inadequately met. A checking force of three men was used.

YOSEMITE NATIONAL PARK

Blister rust control activities in Yosemite were concentrated in the Bald Mountain and Crane Flat units. The Crane Flat Camp was activated and served as an operating base for an eradication crew of about 25 men and a checking crew of about 12. Several checkers were quartered at the Mather Ranger Station and boarded at Camp Mather.

Crew work was limited to reeradication in Section 24, T.2S., R.19E., which is an area of old cut-over and is still quite active ecologically. The standard 3-man-crew method was used and 507 acres were worked.

In addition to the usual contract, post, and regular checking assignments, the checking force completed 1,381 acres of ribes eradication in maintenance and light-concentration areas. The wide-strip checking and eradication method recently developed for such situations was used exclusively except for contract inspection.

Private contractors completed work on 10 separate items totaling 799 acres. Contracts were let for ribes eradication on an additional 264 acres. This work will be completed in 1959.

During the latter part of the season potential infection areas in the Miguel Meadows, Spider Meadows, and upper Alder Creek were scouted for blister rust. About 7,000 ribes plants were examined. Pinyon rust was found on only 5 plants. No blister rust was discovered.

A two-day blister rust control conference and field meeting was held in September. It was attended by National Park Service representatives from

San Francisco, Lassen Park, and Yosemite. Maintenance checking and eradication procedures received major emphasis.

An additional 1,583 acres were added to maintenance this year.

SEQUOIA AND KINGS CANYON NATIONAL PARKS

In Sequoia and Kings Canyon Parks a small crew operating out of the Redwood Mountain Camp completed nearly all presently required work in Redwood Canyon. Portions of this unit have had only one previous working. Others support difficult ribes populations which have not yet reached the degree of ecologic stability necessary for maintenance status. In still other portions of the unit little regeneration following the last eradication was noted, and about 1,200 acres were added to maintenance.

A seasonal force of 8 checkers and 10 laborers was employed. No contracts were let and no high country work was done.

TABLE 1

STATUS OF RIBES ERADICATION IN CALIFORNIA AS OF DECEMBER 31, 1958

Ownership	Control Operation	Control Units		Status of Ribes Eradication			
				Net Acres by Workings			Acres on Maint.
		Total Acres	Acres Unworked	Initial	Reerad.	Maint. Work	
WORK DONE BY THE STATE COOPERATIVE PROJECT							
PRIVATE LAND	Mendocino (Glenn County)						
	Klamath (Siskiyou County)	2,300		2,300	3,974	1,882	2,300
	Shasta-Trinity (Siskiyou and Shasta Counties)	5,028	903	4,125	2,338		220
	Modoc (Siskiyou and Modoc Counties)	6,706	4,353	2,353			
	Lassen (Tehama, Butte, Plumas, and Shasta Counties)	96,218	20,014	76,204	84,377	1,206	44,263
	Plumas (Plumas, Butte, Yuba, and Sierra Counties)	25,296	4,268	21,028	40,722		
	Tahoe (Sierra, Nevada, and Placer Counties)	1,963	62	1,901	941		
	Eldorado (Eldorado, Placer, and Amador Counties)	42,823	7,807	35,016	66,289		8,320
	Stanislaus (Calaveras and Tuolumne Counties)	8,112	316	7,796	17,445		1,724
	Sierra (Mariposa, Madera, and Fresno Counties)	14,278	1,302	12,976	10,581	66	620
	TOTAL	202,724	39,025	163,699	226,667	3,154	57,447
STATE LAND	Latour State Forest	2,355	755	1,600	1,791	41	674
	Blodgett Forest-Univ. of Calif.	940		940	2,778		
	D. L. Bliss-Emerald Bay State Parks	2,240		2,240			
	Calaveras Big Trees State Park	4,259		4,259	9,187		2,827
	Mountain Home State Forest	878	130	748	32		
	TOTAL	10,672	885	9,787	13,788	41	3,501
TOTAL STATE AND PRIVATE		213,396	39,910	173,486	240,455	3,195	60,948
WORK DONE BY THE FOREST SERVICE							
NATIONAL FOREST LAND	Mendocino	7,734	6,631	1,103	1,025		
	Klamath	2,238		2,238	2,326	765	2,238
	Shasta-Trinity	12,018	4,648	7,370	4,453		321
	Modoc						
	Lassen	22,717	7,991	14,726	10,914	306	4,390
	Plumas	62,400	15,953	46,447	69,252	395	2,066
	Tahoe	20,138	2,087	18,051	11,725		
	Eldorado	38,049	9,867	28,182	37,907	10	4,826
	Stanislaus	43,375	422	42,953	89,544		15,391
	Sierra	49,704	19,308	30,396	39,544	51	500
	Sequoia	5,807		5,807	3,397		486
	TOTAL	264,180	66,907	197,273	270,087	1,527	30,218
WORK DONE BY THE NATIONAL PARK SERVICE							
NATIONAL PARK LAND	Lassen Volcanio	25,847	781	25,066	26,111	1,424	17,779
	Yosemite	85,697	3,627	82,070	108,081	7,989	56,430
	Sequoia-Kings Canyon	50,576	2,632	47,944	58,386	7,247	42,420
	TOTAL	162,120	7,040	155,080	192,578	16,660	116,629
ALL WORK DONE IN CALIFORNIA							
ALL CONTROL OPERATIONS		639,696	113,857	525,839	703,120	21,382	207,795

TABLE 2

SUMMARY OF RIBES ERADICATION IN CALIFORNIA - 1958

Ownership	Control Operation	Acres Worked (Contract And Camp Crews)	Acres Checked And Meeting Standards Without Work	Acres Total	Total Man Days	Thousands of Ribes Destroyed	Total Acres Checked (All Classes)	Contract Eradication: Acres Worked	Contract Eradication: Average Price Per Acre Paid to Contractor
WORK DONE BY STATE COOPERATIVE PROJECT									
PRIVATE LAND	Mendocino (Glenn County)								
	Klamath (Siskiyou County)								
	Shasta-Trinity (Siskiyou and Shasta Counties)	1,817	77	1,894	1,224	133	6,358	1,817	$ 8.80
	Modoc (Siskiyou and Modoc Counties)	1,178	6	1,184	450	90	3,371	1,178	7.46
	Lassen (Tehama, Butte, Plumas, and Shasta Counties)	4,639	2,314	6,953	766	101	15,032	3,532	4.92
	Plumas (Plumas, Butte, Yuba, and Sierra Counties)	2,026	1,112	3,138	1,318	803	5,714	1,838	9.05
	Tahoe (Sierra, Nevada, and Placer Counties)	34	46	80	9	15	142	34	5.18
	Eldorado (Eldorado, Placer, and Amador Counties)	820	1,235	2,055	215	54	3,687	722	5.59
	Stanislaus (Calaveras and Tuolumne Counties)	1,182	1,798	2,980	283	103	3,687	1,182	4.58
	Sierra (Mariposa, Madera, and Fresno Counties)	1,112	269	1,381	521	260	3,489	1,045	9.03
STATE LAND	Latour State Forest	337	627	964	49	8	804	236	4.63
	Blodgett Forest-Univ. of Calif.						370		
	D. L. Bliss-Emerald Bay State Parks								
	Calaveras Big Trees State Park								
	Mountain Home State Forest	44		44	40	6			
ALL WORK DONE BY THE STATE COOPERATIVE PROJECT	Initial Work	3,970	711	4,681	2,207	690			
	Reeradioation	8,650	6,773	15,423	2,571	852			
	Maint. Work	569		569	97	31			
	All	13,189	7,484	20,673	4,875	1,573	42,654	11,584	$ 6.82
WORK DONE BY THE FOREST SERVICE									
NATIONAL FOREST LAND	Mendocino	1,000	60	1,060	220	118	1,045	965	$ 5.04
	Klamath								
	Shasta-Trinity	1,482	904	2,386	740	36	5,417	1,473	8.31
	Modoc								
	Lassen	1,727	445	2,172	406	61	8,638	1,521	4.43
	Plumas	3,535	6,712	10,247	1,473	826	14,053	3,221	8.85
	Tahoe	2,057	1,826	3,883	485	894	8,349	2,026	5.08
	Eldorado	1,372	1,139	2,511	540	192	4,716	1,344	4.65
	Stanislaus	1,906	1,335	3,241	536	368	5,567	1,906	5.89
	Sierra	1,255	1,723	2,978	708	196	10,253	1,176	10.48
	Sequoia	436	2,879	3,315	185	37	465	266	5.91
ALL WORK DONE BY THE FOREST SERVICE	Initial Work	4,551	5,181	9,732	2,406	798			
	Reeradication	9,958	11,842	21,800	2,858	1,919			
	Maint. Work	261		261	29	11			
	All	14,770	17,023	31,793	5,293	2,728	58,503	13,898	$ 6.76
WORK DONE BY THE NATIONAL PARK SERVICE									
NATIONAL PARK LAND	Lassen Volcanic	691	551	1,242	388	201	2,995	656	$11.64
	Yosemite	2,687	2,501	5,188	1,759	254	6,500	799	10.00
	Sequoia-Kings Canyon	2,069	1,230	3,299	643	57	2,600		
ALL WORK DONE BY THE NATIONAL PARK SERVICE	Initial Work	1,023	165	1,188	584	246			
	Reeradioation	3,071	4,117	7,188	1,947	259			
	Maint. Work	1,353		1,353	259	7			
	All	5,447	4,282	9,729	2,790	512	12,095	1,455	$10.74
ALL WORK DONE IN CALIFORNIA									
ALL OWNERSHIPS ALL AGENCIES	Initial Work	9,544	6,057	15,601	5,197	1,734			
	Reeradioation	21,679	22,732	44,411	7,376	3,030			
	Maint. Work	2,183		2,183	385	49			
	All	33,406	28,789	62,195	12,958	4,813	113,252	26,937	$ 7.00

THE BLISTER RUST CONTROL PROGRAM

PACIFIC NORTHWEST REGION

1958

BY: BENTON HOWARD
FORESTER

S(BR)
REPORTS
Annual - 1958
(Pacific Northwest Region)

Portland, Oregon
April 15, 1959

THE BLISTER RUST CONTROL PROGRAM
PACIFIC NORTHWEST REGION

1958

The control of white pine blister rust is a continuing program on selected western white and sugar pine stands in southwestern Oregon. Three Federal agencies are perpetuating the white pines on carefully selected areas. The Bureau of Land Management and the U. S. Forest Service are managing stands of commercial timber on sites where the pines are expected to produce more volume of wood than the competitive species. The National Park Service is giving protection to a typical western white pine stand in Crater Lake National Park.

Control of this introduced disease is achieved by the eradication of ribes (currants and gooseberries) from within the stands. Since the disease must travel from pine to ribes to pine, and cannot go directly from pine to pine, this method of control is effective.

The general leadership, coordination and technical direction of the program for all owners is a responsibility of the Forest Service.

ACCOMPLISHMENTS - 1958

SURVEYS

Ribes surveys to determine the need for eradication work, to establish work standards, and to appraise the quality of the eradication work were made.

Blister rust damage surveys were made on the Rogue River and Umpqua National Forests. Survey work is summarized in the following table:

SUMMARY OF SURVEYS - 1958

Agency	Acres Covered				Man Days
	Ribes	Damage	Pine Appraisal	Total	
Forest Service	9,931	3,420	-	13,351	358
Bureau of Land Management	12,117	-	10,900	23,017	548
Total	22,048	3,420	10,900	36,368	906

RIBES ERADICATION

Ribes were eradicated from young pine stands and plantations where they were present in sufficient numbers to cause a hazard to the timber. Details of the year's accomplishment are shown in the following table:

SUMMARY OF RIBES ERADICATION - CALENDAR YEAR - 1958

Agency	Class of Work	Land Ownership	Acres Worked	Acres Meeting Standard w/o Work	Acres Total	Man Days	M Ribes Destroyed	Acres Worked By Contract	Ave. Price Paid PerA.
Forest Service	Initial	N.Forest	1,064	345	1,409	551	85	-	-
		Private	158	-	158	79	10		
		Total	1,222	345	1,567	630	95	747	$5.67
	ReErad	N.Forest	2,200	6,345	8,545	1,150	59	822	$4.47
	Maint.	N. Forest	1,085	1,647	2,732	101	2		
	All	All	4,407	8,337	12,844	1,881	136	1,569	$5.04
BLM	Initial	O & C	619	272	891	369	113		
		Private	60	-	60	1	-		
		Total	679	272	951	370	113		
	ReErad	O & C	207	-	207	98	15		
		P.Domain	20	-	20	2	-		
		Private	105	-	105	72	3		
		Total	332	-	332	172	18	483	$7.77
	Maint.	O & C	335	1,690	2,025	43	3		
		P.Domain	20	-	20	1	-		
		Private	251	-	251	17	2		
		Total	606	1,690	2,296	61	5	312	$6.21
	All	All	1,617	1,962	3,579	603	136	795	$7.17
All Agencies	Initial	N.Forest	1,064	345	1,409	551	85		
		O & C	619	272	891	369	113		
		Private	218	-	218	80	10		
		Total	1,901	617	2,518	1,000	208		
	ReErad	N.Forest	2,200	6,345	8,545	1,150	39		
		O & C	207	-	207	98	15		
		P.Domain	20	-	20	2	-		
		Private	105	-	105	72	3		
		Total	2,532	6,345	8,877	1,322	57		
	Maint.	N.Forest	1,085	1,647	2,732	101	2		
		O & C	335	1,690	2,025	43	3		
		P.Domain	20	-	20	1	-		
		Private	251	-	251	17	2		
		Total	1,691	3,337	5,028	162	7	2,364	$5.76
	All Workings	N.Forest	4,349	8,337	12,686	1,802	126	-	-
		O & C	1,161	1,962	3,123	510	131		
		P.Domain	40	-	40	3	-		
		Private	574	-	574	169	15		
		Total	6,124	10,299	16,423	2,484	272	2,364	$5.76

WHITE PINE MANAGEMENT

Correlation between the disease control aspects and the timber management activities was increased during the year. Both the Umpqua and Rogue River Forests prepared and put into effect, management plans insuring consideration of all factors in the handling of the pine management units. Pruning of infected crop trees was continued. A few trees were treated with the fungicide, Acti-dione.

DEVELOPMENT OF RUST-RESISTANT STRAINS OF THE WHITE PINES

The tempo of the developmental work was greatly increased during the year. The Region assigned T. E. Greathouse as a geneticist in the Division of Timber Management. About one-half of his time is devoted to applied genetics work on the production of rust-resistant strains.

With the assistance of the Division of Disease Research, progeny-testing of rust-resistant candidates was begun at Wind River. Artificial inoculations of seedlings from wind-pollinated seed was done. This work will be continued as rapidly as seed becomes available. Wind-pollinated seed was collected from 14 western white pines during 1958. No seed has yet been produced by the rust-resistant sugar pine.

An additional 54 rust-resistant western white pine were located in four areas on the Olympic and Snoqualmie National Forests. Sixteen more sugar pine rust-resistant candidates were found in southwest Oregon.

Selving was done on nine rust-resistant white pines, and seven of these were crossed with other rust-resistant candidates. Most trees set cones as a result of the pollination.

Soil fertilization and release of candidate trees were continued. The affect of fertilization has been difficult to evaluate.

STATUS OF THE PROGRAM

The status of the control program is shown in the following table:

STATUS OF THE BLISTER RUST CONTROL PROGRAM
IN THE PACIFIC NORTHWEST

By Agency and Ownership
As of December 31, 1958

Administrative Unit	Land Ownership	Acres + Control: White Pine	Protection Zone	Area: Total	Acres Worked Initially	Requiring Future Work: Initial	ReErad	Maint.	% of Mtn
FOREST SERVICE									
Umpqua	N.Forest	58,134	6,139	64,273	11,348	52,925	10,420	928	14
	Private	1,034	96	1,130	-	1,130	-	-	-
	Total	59,168	6,235	65,403	11,348	54,055	10,420	928	14
Rogue River	N.Forest	57,175	150	57,325	57,231	94	41,449	15,782	28
	Private	-	3,092	3,092	3,065	27	3,065	-	-
	Total	57,175	3,242	60,417	60,296	121	44,514	15,782	26
Siskiyou	N.Forest	28,429	2,523	30,952	30,952	-	15,351	15,601	50
	Private	-	2,154	2,154	2,154	-	1,323	831	39
	Total	28,429	4,677	33,106	33,106	-	16,674	16,432	49
Total	N.Forest	143,738	8,812	152,550	99,531	53,019	67,220	32,311	21
	Private	1,034	5,342	6,376	5,219	1,157	4,388	831	13
	Total	144,772	14,154	158,926	104,750	54,176	71,608	33,142	21
BUREAU OF LAND MANAGEMENT									
Medford	O & C	48,845	1,672	50,517	49,772	745	19,531	30,241	60
	P.Domain	1,463	164	1,627	1,617	10	467	1,150	71
	N.Forest	-	10	10	10	-	-	10	100
	Private	-	9,191	9,191	8,081	1,110	2,928	5,153	56
	Total	50,308	11,037	61,345	59,470	1,865	22,926	36,554	60
Roseburg Dist.	O & C	7,580	1,185	8,765	674	8,091	674	-	-
TOTAL	O & C	56,425	2,857	59,282	50,446	8,836	20,205	30,241	51
	P.Domain	1,463	164	1,627	1,617	10	467	1,150	71
	N.Forest	-	10	10	10	-	-	10	100
	Private	-	9,191	9,191	8,081	1,110	2,928	5,153	56
	Total	57,888	12,222	70,110	60,154	9,956	23,600	36,554	52
NATIONAL PARK SERVICE									
Crater Lake	NPS	3,632	-	3,632	3,632	-	-	3,632	100
ALL AGENCIES									
	O & C	56,425	2,857	59,282	50,446	8,836	20,205	30,241	51
	P.Domain	1,463	164	1,627	1,617	10	467	1,150	71
TOTAL	N.Forest	143,738	8,822	152,560	99,541	53,019	67,220	32,321	21
	N.P.S.	3,632	-	3,632	3,632	-	-	3,632	100
	T.Federal	205,258	11,843	217,101	155,236	61,865	87,892	67,344	31
	" Private	1,034	14,533	15,567	13,300	2,267	7,316	5,984	38
	Total	206,292	26,376	232,668	168,536	64,132	95,208	73,328	32

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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

WHITE PINE BLISTER RUST CONTROL

REGIONS SEVEN AND EIGHT

CALENDAR YEAR 1958

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

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WHITE PINE BLISTER RUST CONTROL IN THE EASTERN REGION

ANNUAL REPORT FOR 1958

United States Department of Agriculture

FOREST SERVICE

Region 7 Upper Darby, Pa.

TABLE OF CONTENTS

WHITE PINE BLISTER RUST CONTROL

ANNUAL REPORT - 1958

U. S. FOREST SERVICE REGIONS 7 & 8

The forests of the nation play an important and vital role in the daily life of its people. In addition to contributing to soil stability and conservation of water they provide recreational and economic resources of great value. The harvesting, manufacture and utilization of timber resources contribute substantially to the economy of this country. With an expanding population and increasing demand for wood and its by-products there is a pressing need to protect the forests from losses due to fire, insects and disease.

Destruction of timber by fire is spectacular and recognized by everyone. Excellent progress has been made in reducing fire losses. The destructive damage caused by forest insects and disease is less spectacular. However, they are two of the principal causes of drain on timber resources.

WHITE PINE - A HOST OF BLISTER RUST DISEASE

White pine, one of our most important timber trees, is destroyed by a fungus disease known as white pine blister rust. Introduced into this country on planting stock, the disease has gradually spread throughout the range of white pine in the United States and Canada.

The disease is spread by small spores carried by moist air currents. The spores produced on diseased white pine are released in the spring of the year. They germinate, grow and spread from leaf to leaf of an alternate host plant during the summer. Currants and gooseberries are alternate hosts for white pine blister rust and are referred to collectively by their generic name, ribes. In late summer and fall another spore is produced by the blister rust fungus growing on a ribes leaf. It is this spore that infects healthy white pine. Blister rust cannot spread from one pine to another.

Spread of blister rust from ribes to pine is very limited due to the fragile life of the spore produced on ribes. Control of the disease is accomplished by destroying those ribes growing in association with white pine. During the past four decades decisive and economical control of the rust has been established on 92% of the 7.3 million acres of white pine in Regions 7 and 8.

PURPOSE OF THE BLISTER RUST PROGRAM

The purpose of the program is to establish and maintain control of the disease by the most efficient and economical means in white pine stands of sufficient value to justify protective measures.

SCOPE OF THE PROGRAM

In the Appalachian Mountain Range, eastern white pine of sufficient value to justify control treatment is found on 7.3 million acres. To provide protection to this pine, ribes must be removed from 17.2 million acres of control area. Of this, 84% is in state and private ownership; 14% is in national forest lands and the remaining 2% is in national parks and Indian lands. Statistical tables located in the Appendix summarize accomplishments and present status of control by states, land ownership and Forest Service Regions.

ORGANIZATION AND COOPERATION

The Forest Service, operating within the provisions of the Lea Act, conducts control operations to protect the pine on national forest lands and cooperates with states and other agencies in protecting the pine on state and private lands. The Act is implemented by the Forest Service through leadership and technical direction of the Pest Control Section in the Division of State and Private Forestry. Field direction is provided by 23 district leaders under supervision of three area leaders.

Cooperative financing on a reimbursement basis operated successfully in Maine, New Hampshire, Vermont, Virginia and West Virginia. It has resulted in simplifying personnel employments and has made it possible to hire full-time field men for control area examination, mapping and eradication.

STATUS OF CONTROL

Control has been established on approximately 16 million acres or 92.3% of the present control area. This is a slight increase over 1957 and is close to the maximum acreage that may be expected to be on maintenance at any one time. Harvesting, fire and winds decrease the area on which control has been established. New plantations and natural seeding establishes new stands in need of protection. During 1958 these influences resulted in a reduction of 108,429 acres of control area and a net increase of 8,700 acres of white pine. New pine regeneration occurred frequently within previously established control areas while protective zones were reduced on many areas during current survey activities.

DISEASE CONDITIONS

Infection on ribes was generally heavy throughout the Regions with a few local exceptions. Infection was observed on R. missouriensis near Doeville, Johnson City, Tennessee. This is the first time infection has been observed on this species. Aeciospores were the heaviest ever observed in North Carolina. Three cankers on 1956 wood were producing aecia this spring (on 2 year old wood). Some new pine infection areas were noted in North Carolina but elsewhere new infections on white pine are generally at a low level. Weather conditions over most of the region were favorable for transmission of the disease from ribes to white pine.

CONTROL ACTIVITIES - 1958

In Region Seven, ribes were destroyed on 195,000 acres of control area. Effective man days of employment on eradication work totaled 13,591 or 14.3 acres per man day. An additional 231,000 acres of premaintenance area and 1,270,000 acres on maintenance were examined and found satisfactory without intensive eradication work. The 231,000 acres that did not require intensive work would have been shown in previous reports as crew work. Thus the accomplishment for 1958 compares favorably with previous accomplishments. However, by eliminating over 50% of the control area thru careful examination, the true picture of ribes distribution is revealed and better estimates can be made of the over-all control job.

Approximately 5½% of the maintenance area examined required intensive work to reduce ribes populations to allowable limits. Local disturbance of the forest by fire, wind or logging accounted for ribes regeneration in most of these areas. Persistent regeneration of ribes accounted for the work needed on a few of the areas on maintenance.

Treatment of ribes by chemical means increased in all states. Nearly all eradication work in Maine and New Hampshire was accomplished by chemical control.

In North Carolina and Tennessee (Region 8), ribes were removed from 477 acres of control area. Twenty-eight man days of labor were used. An additional 2,900 acres of maintenance area examined showed no need for intensive eradication measures. In North Carolina guidelines were established for conducting control work in connection with rapidly expanding planting programs. Steps were taken to gear pre-planting inspection to the planting program.

Ribes eradication in North Carolina was accomplished entirely by chemical means. A mixture of 6 pounds acid equivalent 2,4,5-T in 100 gallons of # 2 fuel oil was applied as a basal spray.

RIBES ERADICATION ON STATE AND PRIVATE LANDS

Eleven states cooperated in the 1958 program. Intensive eradication was completed on 184,921 acres. Of this amount 17% was initial work, 44% rework and 39% was maintenance work. Maintenance examination of slightly over 2 million acres resulted in intensive work on 71,700 acres or 3.3% of the area examined. Control has been established on 91.6% of the control area on state and private lands.

Present knowledge of ribes distribution in Kentucky is limited. Surveys have been confined to a relatively small area where native white pine is found. An expanding white pine planting program is underway and a general survey is needed to determine ribes distribution.

RIBES ERADICATION ON NATIONAL FORESTS

Eleven national forests in Regions 7 and 8 contain 1,882,839 acres of control area including 1,067,496 acres of white pine. Protection has been established on 96.6% of the control area. Control operations are being performed as scheduled. Ribes-bearing lands on the national forests in Virginia and West Virginia prove to be only a small portion of the total area examined. However, infections resulting from small concentrations of ribes indicate the need for periodic examinations and removal of ribes under these conditions.

White Mountain National Forest

In the Passaconway area 6,000 ribes were destroyed on 526 acres of maintenance area. This control area is located along a new highway extending from Conway to Lincoln. The white pine is a part of the esthetic beauty of the scenic highway.

Allegheny National Forest - Pennsylvania

Examinations during 1958 resulted in an increase of 390 acres of control area including 80 acres of white pine. Initial work was completed on 150 acres of the control area. An additional 526 acres of maintenance area were examined. Protection has been established on 88.6% of the 4,475 acres of control area on the forest.

Monongahela National Forest - West Virginia

Protection has been established on 90.6% of the 88,894 acres of blister rust protection area on the forest. Surveys show an increase of 200 acres of white pine in 1958. A total of 47,779 acres are now mapped for blister rust control. Ribes eradication was performed on 814 acres of rework and 100 acres of maintenance work during 1958.

George Washington National Forest - West Virginia

Protection has been established on 85.4% of the 71,373 acres, including 42,191 acres of white pine control operations during 1958 included 195 acres of rework and 1,553 acres of maintenance work.

George Washington National Forest - Virginia

Protection has been established on 92% of the 430,461 acres of control area, including 191,500 acres of white pine. Control work in 1958 included 105 acres of initial work, 4,432 acres of rework, and 1,418 acres of maintenance work. Net control area on the forest in Virginia and West Virginia was reduced by 1,100 acres. White pine acreage was increased by 320 acres.

Jefferson National Forest - Virginia

Protection has been established on 97% of the 126,916 acres of control area. White pine acreage was slightly increased to 63,732 acres as the result of 1958 examinations. A total of 457 acres of rework and 553 acres of maintenance work was accomplished in 1958.

Cumberland National Forest - Kentucky

After a lapse of 11 years since last examination in 1947, a total of 1,925 acres on maintenance were examined this year. Only 64 ribes were found on 105 acres considered as ribes-bearing on original working. Surveys show 16,980 acres of white pine with a control area of 32,002 acres all of which is on a maintenance basis. Protection has been established on 100% of the control area.

North Carolina National Forest

Protection has been established on 98.6% of the control area. The present control area consists of 230,947 acres including 136,365 acres of white pine. During 1958, 2,300 ribes were removed from 15 acres of initial area. Maintenance examination on 265 acres showed no need of eradication. A total of 1,100 acres were examined to determine ribes conditions.

ERADICATION WORK ON NATIONAL PARKS

Saratoga Battle Field National Monument - New York

Control of the disease on the Park involves 1,450 acres, including 135 acres of white pine. During 1958 initial work was completed on 213 acres and 4,000 ribes were removed. All of the control area has been worked at least once and protection has been established on 100% of the control area. Reworking of 1,250 acres is scheduled for 1963.

Blue Ridge Parkway - Virginia

A total area of 1,780 acres containing 415 acres of white pine is designated for blister rust control. Protection has been established on 19% of this area. During 1958, 1,014 ribes were removed from 188 acres of rework and 179 acres of maintenance work. Examination of 800 acres is scheduled for 1961.

Checking Ribes Eradication Work

The efficiency and maintenance of accepted control standards for eradication can be determined best through systematic checking of completed work. This is accomplished by means of formal measured checks on worked areas and by checking ribes sites on areas requiring only examination surveys.

In Vermont there was a slight increase in areas checked over the preceding year. New York district leaders reported a 1½% check of the worked area. Maintenance area examined in many districts did not receive sufficient checking. In Pennsylvania about 75% of the worked areas were checked. A few areas not meeting required standards were reworked. The checking program in the Southern Appalachians was adequate to insure a standard of 25 feet of live stem per acre. Most of the checking was general and usually involved examination of likely ribes sites. Formal measured checks were made to support findings on general random checks.

Nursery Sanitation

All nursery sanitation work in the Regions was completed as scheduled. This included the new soil bank nursery at Greenbush, Maine where initial control was completed to protect all beds of white pine planting stock. In New York re-examination was completed on all state nurseries. Two nurseries were examined in Massachusetts. Examinations were not scheduled for the remaining nurseries this year.

Canker Elimination

Improvement of white pine stands through canker pruning and removal of blister rust infected dead and dying trees was continued on recreational sites in New York. A total of 1,360 trees were examined; 144 cankers were removed from 124 trees and 250 fatally infected pines were removed. Total employment amounted to 39 man days. A total of 85 trees were examined in West Virginia and Maryland of which 14 were treated and 38 were removed.

Chemical Control of Ribes

As a means toward a more effective and efficient method of ribes eradication, chemical treatment has been developed and extended to a considerable amount of eradication work. The chemical herbicide 2,4, 5-T has been used with generally good results. Applications have been made on ribes concentrations as a foliage spray using 6 pounds acid equivalent 2,4,5-T in 100 gallons of water. Basal stem treatment on scattered ribes using 19 pounds acid equivalent 2,4,5-T in 100 gallons of # 2 fuel oil has also proved effective. Selection of suitable small hand applicators has been a problem. Various types have been used without complete satisfaction for all operations. Continued efforts are being made to find a sprayer best suited for the work. Three back-pack power mistblowers used during 1958 show promise of successful treatment on large ribes concentrations. Final results of treatment with this type of equipment will be determined in 1959.

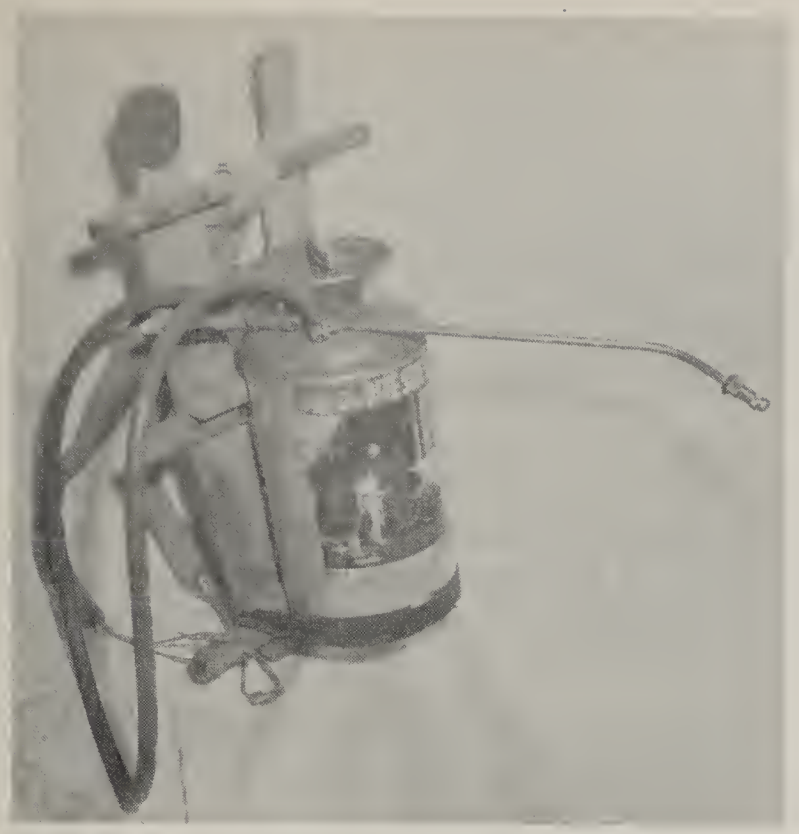
CHEMICAL CREW IN ACTION

Ribes are located by the crew and treated with 2,4,5-T in oil as a basal treatment.

(Photo by J. Marsh,- Me. F.S.)

Tests will be made in 1959 with a new formulation of 2,4,5-T now manufactured by an invert process which emulsifies with water and does not separate in solution. The invert formula promises to have a number of features superior to the regular 2,4,5-T now in use. Dry chemicals, Telvar and Karmex, were tried experimentally with undetermined results.

A POWER-OPERATED MISTBLOWER
Used on ribes concentrations



HAND-OPERATED SPRAY TANK AND PACK-BACK

This spray applicator proves useful in treating scattered ribes plants.

Based on several years of testing and experience standard formulations and spray techniques have been prepared for chemical work. These will be in use in 1959. Any change in formulation or application of new herbicides will be considered as experimental until results are determined.

Chemical control accomplishments are summarized in table No. 4 of the Appendix.

SPECIAL ACTIVITIES

Testing Acti-dione

Since the beginning of blister rust control work pruning of infected branches and limbs has been used to augment the eradication program as a means of saving white pine of especially high value. Recently an antibiotic designated Acti-dione has been discovered which is effective in killing blister rust cankers on western white pine. Canker elimination is inexpensive and effective.

Tests were started in October for measuring the effectiveness of Acti-dione on Eastern White Pine canker elimination. Sapling and pole size pine are being treated using three different methods of treatment and three different strengths of solution. Tests are Region-wide.

Ribes Ecology Studies

Ribes ecology field data collections were suspended during 1958 pending a preliminary analysis of data collected in 1957. Additional data collections will be made on non-recurring ribes sites to broaden the basis for comparison purposes before making a final analysis.

Infection Studies

Data on infection study plots taken in Vermont show less than 5% infection by stem count on controlled areas. Infection on non-controlled areas ranged from 7 to 18%.

Other Activities

Participation by blister rust personnel in other pest and disease control programs during 1958 include the following:

> Oak wilt control in Kentucky and West Virginia, white pine weevil control on the Allegheny National Forest and on Cook State Forest in Pennsylvania, and the spruce budworm spray project in northern Maine. Men were detailed to these jobs for short periods in a manner that did not interfere with their primary assignment to blister rust control.

Informational Activities

A strong I & E program has always been an active part of blister rust control work. Of exceptional note was the increased number of show-me trips during 1958. Blister rust leaders in the Southern Appalachian Area have been quite successful in a special effort to draw forest managers, farm foresters, forest rangers, park officials and others into the planning and program aspects of blister rust control.

Some preliminary work has been done in preparation for producing a new motion picture film. This film will be on white pine management, with emphasis in blister rust control.

FINANCING

With only minor exceptions the blister rust control program is adequately financed to establish and maintain control on the white pine that is currently judged of sufficient value to justify control measures. Large and extensive planting programs in many states place a strain on control activities and adjustments have to be made to provide adequate protection to the new stands. A change

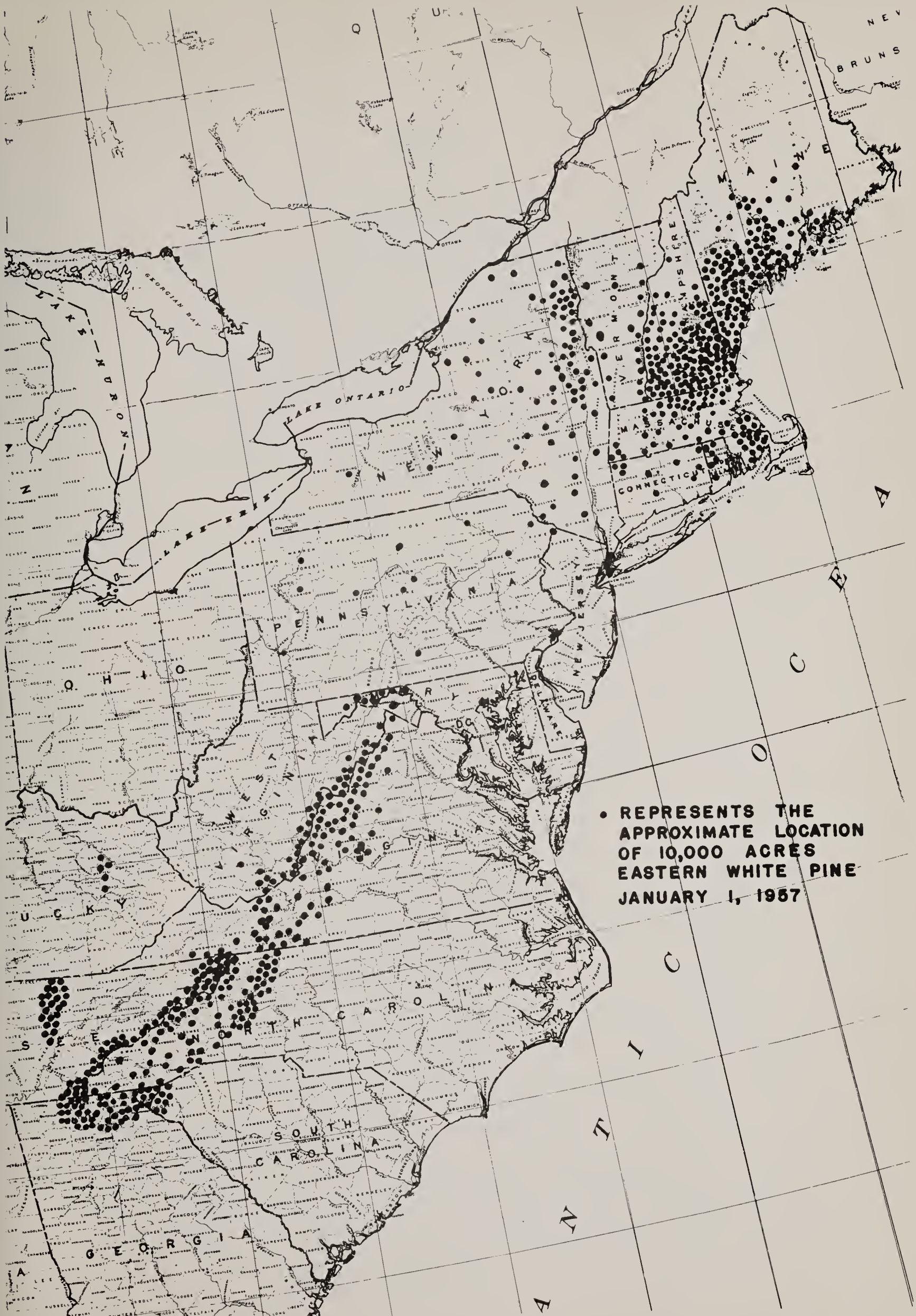
from town fund appropriations to state-wide financing would be desirable in Maine, New Hampshire and Vermont. This would provide funds for control work at the proper time where the need is greatest. Virginia made an additional $2,000 available for control work on state and private lands. This was of great help in bringing state and private control work nearer to schedules. A similar contribution another two or three years will eliminate the backlog of work in this state. State funds in North Carolina have been doubled for fiscal year 1959 to handle pre-planting inspection in connection with the Soil Bank Program.

SAFETY

Only one minor accident, a case of ivy poisoning, occurred to mar an otherwise perfect safety record. Accidents to personnel resulted in the loss of only 5 man days during the year. Formal safety training programs are part of over-all training given in each district. These are supplemented by on-the-job training and frequent inspections to insure safety in all blister rust control operations.

FEDERAL VEHICLES

The final step in modernizing the fleet of federal vehicles assigned to the project was completed in 1958. Total vehicles in operation were reduced by nine during the year.


LAKE HURON
LAKE ERIE
LAKE ONTARIO
GEORGIAN BAY
OTTAWA
ST LAWRENCE
NEW YORK
VERMONT
NEW HAMPSHIRE
MAINE
MASSACHUSETTS
CONNECTICUT
PENNSYLVANIA
OHIO
WEST VIRGINIA
VIRGINIA
KENTUCKY
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
DELAWARE
ATLANTIC OCEAN
• REPRESENTS THE APPROXIMATE LOCATION OF 10,000 ACRES EASTERN WHITE PINE
JANUARY 1, 1957

APPENDIX

Statistical Tables

Table - 1 - Informational & Service Activities - 1958

(Including Area Leaders)

State	Meetings Addressed		Programs	No. Items Published	No. Demonstrations Placed	Show-Me Trips	Film Showings	
	No.	Attendance	Radio & T. V.				No.	Attendance
Me.	35	2,058	1	11	11	23	14	1,642
N. H.	23	988	3	44	10	46	7	197
Vt.	11	211	1	19	2	4	7	192
Mass.	2	15	-	-	1	-	-	-
Conn.	1	23	-	1	1	2	1	23
N. Y.	61	2,783	2	47	13	98	81	6,895
Pa.	3	148	6	8	3	3	16	830
W. Va.	2	110	-	-	1	1	2	45
Va.	4	82	-	5	7	7	3	34
Sub-Total Region 7	142	6,418	13	135	49	184	131	9,858
Tenn.	-	-	-	-	-	-	3	126
N. C.	6	98	-	1	-	6	-	-
Sub-Total Region 8	6	98	-	1	-	6	3	126
Totals	148	6,516	13	136	49	190	134	9,984

Table 2 Surveys During 1958

State	Ownership	Acreage of Control Area		Total Man Days
		Examined for Any Purpose	Mapped	
Me.	State & Private	540,302	135,226	2,737
N. H.	State & Private	472,338	137,369	3,001
N. H.	Nat'l Forest	800	526	3
Vt.	State & Private	103,730	32,786	373
Mass.	State & Private	96,378	58,166	469
Conn.	State & Private	59,775	18,698	583
N. Y.	State & Private	635,499	223,643	2,982
Pa.	State & Private	118,508	9,486	426
Pa.	Nat'l Forest	4,830	390	13
Md.	State & Private	850	-	2
W. Va.	State & Private	100,087	8,311	459
W. Va.	Nat'l Forest	27,768	143	145
Va.	State & Private	96,800	7,490	336
Va.	Nat'l Forest	143,696	1,068	295
Va.	Nat'l Park	3,034	-	33
Ky.	Nat'l Forest	1,925	-	7
Sub-Total R-7		2,406,320	633,302	11,864
Tenn.	State & Private	190	-	2
Tenn.	Nat'l Forest	75	-	1
N. Car.	State & Private	8,841	312	63
N. Car.	Nat'l Forest	1,100	-	4
N. Car.	Nat'l Park	2,378	-	119
Sub-Total R-8		12,584	312	189
Totals	State & Private	2,233,298	631,487	11,433
	Nat'l Forests	180,194	2,127	468
	Nat'l Parks	5,412	-	152
	ALL	2,418,904	633,614	12,053

Table 3 - Maintenance Activities

State	Ownership	Total Acreage Examined	Portion Requiring Intensive Control Measures				
			Acres Worked	Ribes Destroyed	Man Days	Acres Per Man Days	Ribes Per Acre
Me.	S & P	223,365	2,886	128,028	497	5.8	44.3
N. H.	S & P	196,251	1,137	145,225	153	7.4	127.7
N. H.	Nat'l Forest	526	526	6,014	24	21.9	11.4
Vt.	S & P	67,969	12,452	60,923	337	36.9	4.9
Mass.	S & P	65,500	285	2,710	8	35.6	9.5
Conn.	S & P	41,157	302	3,676	20	15.1	12.1
N. Y.	S & P	383,311	45,817	268,735	1,504	30.4	5.8
N. Y.	Nat'l Park	137	137	1,750	2	68.5	12.7
Pa.	S & P	91,660	1,405	18,212	183	7.6	12.9
Pa.	Nat'l Forest	3,810	165	4,645	47	3.5	28.1
Md.	S & P	1,808	60	138	4	15.0	2.3
W. Va.	S & P	87,879	4,391	9,446	508	8.6	2.1
W. Va.	Nat'l Forest	25,246	1,553	1,296	131	12.6	.8
Va.	S & P	88,139	3,032	17,846	454	6.6	5.9
Va.	Nat'l Forest	64,178	1,971	9,861	314	6.2	5.0
Va.	Nat'l Park	513	179	357	29	6.1	2.0
Ky.	Nat'l Forest	1,925	-	-	7	-	-
Sub-Total Region 7		1,343,374	76,298	678,862	4,222	18.1	8.9
Tenn.	S & P	190	-	-	-	-	-
Tenn.	Nat'l Forest	75	-	-	-	-	-
N. C.	Nat'l Forest	265	-	-	-	-	-
N. C.	Nat'l Park	2,378	-	-	-	-	-
Sub-Total Region 8		2,908	-	-	-	-	-
ALL	S & P	1,247,229	71,767	654,939	3,668	19.5	9.1
	Nat'l Forest	96,025	4,215	21,816	523	8.3	5.0
	Nat'l Park	3,028	316	2,107	31	10.2	6.6
	Totals	1,346,282	76,298	678,862	4,222	18.1	8.9

Table 4 - Chemical Eradication

State	Acres Sprayed	Gallons Used	Man Days
Maine	2,602	2,546	1,073
N. H.	441	1,387	333
Vermont	85	104	53
Mass.	2	40	2
N. Y.	239	2,507	190
Pa.	7	24	1
Va.	20	6	2
Sub-Total R-7	3,396	6,614	1,654
N. Car. R-8	357	70	27
Total - ALL	3,753	6,684	1,681

RIBES ERADICATION WORK - 1958

TABLE 5

Regions 7 & 8

State National Forests National Parks	First Work			Rework			Maintenance Work			All Work		
	Acres	Ribes	Man Days	Acres	Ribes	Man Days	Acres	Ribes	Man Days	Acres	Ribes	Man Days
State and Private Lands												
Maine	2,171	140,499	548	1,912	144,956	490	2,886	128,028	497	6,969	413,483	1,535
New Hampshire	1,574	17,008	49	9,491	357,059	558	1,137	145,225	153	12,202	519,292	760
Vermont	7,951	71,410	410	12,932	68,609	542	12,452	60,923	337	33,335	213,103 *	1,289
Massachusetts	-	-	-	3,469	33,888	375	285	2,710	8	3,754	49,152 *	383
Connecticut	-	-	-	-	-	-	302	3,676	20	302	20,253 *	20
New York	13,807	115,929	649	38,217	356,548	1,933	45,817	268,735	1,504	97,841	812,951 *	4,086
Pennsylvania	3,810	62,282	366	2,732	21,808	183	1,405	18,212	183	7,947	102,302	732
Maryland	-	-	-	1,230	55,701	222	60	138	4	1,290	55,839	226
West Virginia	385	1,987	55	10,136	54,255	1,387	4,391	9,446	508	14,912	65,688	1,950
Virginia	860	3,648	109	2,015	6,477	255	3,032	17,846	454	5,907	27,971	818
North Carolina	362	3,815	24	100	190	2	-	-	-	462	4,149 *	26
Totals-State & Private	30,920	416,578	2,210	82,234	1,099,491	5,947	71,767	654,939	3,668	184,921	2,284,183 *	11,825
National Forests												
White Mountain - N. H.	-	-	-	-	-	-	526	6,014	24	526	6,014	24
Allegheny - Penna.	150	365	4	-	-	-	165	4,645	47	315	5,010	51
Monongahela - West Va.	-	-	-	814	5,100	119	100	439	14	914	5,539	133
Geo. Washington - W. Va.	-	-	-	195	418	37	1,553	857	117	1,748	1,275	154
Geo. Washington - Va.	105	1,298	27	4,432	33,688	926	1,418	5,794	207	5,955	40,780	1,160
Jefferson - Va.	-	-	-	457	2,838	92	553	4,067	107	1,010	6,905	199
N. Carolina N. F. N.C.	15	2,289	2	-	-	-	-	-	-	15	2,289	2
Totals-National Forests	270	3,952	33	5,898	42,044	1,174	4,315	21,816	516	10,483	67,812	1,723
National Parks												
Saratoga Battlefield-N.Y.	213	2,274	9	-	-	-	137	1,750	2	350	4,024	11
Blue Ridge Parkway - Va.	-	-	-	188	657	42	179	357	29	367	1,014	71
Totals-National Parks	213	2,274	9	188	657	42	316	2,107	31	717	5,038	82
Ribes Eradication - All Lands												
Maine	2,171	140,499	548	1,912	144,956	490	2,886	128,028	497	6,969	413,483	1,535
New Hampshire	1,574	17,008	49	9,491	357,059	558	1,663	151,239	177	12,728	525,306	784
Vermont	7,951	71,410	410	12,932	68,609	542	12,452	60,923	337	33,335	213,103 *	1,289
Massachusetts	-	-	-	3,469	33,888	375	285	2,710	8	3,754	49,152 *	383
Connecticut	-	-	-	-	-	-	302	3,676	20	302	20,253 *	20
New York	14,020	118,203	658	38,217	356,548	1,933	45,954	270,485	1,506	98,191	816,975 *	4,097
Pennsylvania	3,960	62,647	370	2,732	21,808	183	1,570	22,857	230	8,262	107,312	783
Maryland	-	-	-	1,230	55,701	222	60	138	4	1,290	55,839	226
West Virginia	385	1,987	55	11,145	59,773	1,543	6,044	10,742	639	17,574	72,502	2,237
Virginia	965	4,946	136	7,092	43,660	1,315	5,182	28,064	797	13,239	76,670	2,248
North Carolina	377	6,104	26	100	190	2	-	-	-	477	6,438 *	28
Total	31,403	422,804	2,252	88,320	1,142,192	7,163	76,398	678,862	4,215	196,121	2,357,033 *	13,630

* Including ribes removed during surveys.

STATUS OF WHITE PINE BLISTER RUST CONTROL

BY LAND OWNERSHIP - REGIONS 7 & 8

SEPTEMBER 30, 1958

TABLE 6

			NET CONTROL ACREAGE							PROJECTED WORK LOAD ACREAGE				
	State	Ownership	White Pine	Control Area	% Initial Worked	On Maintenance	% On Maintenance	Ribes-Free Or Low Hazard	@	1959	1960	1961	1962	1963
R-7	Maine	State & Private	928,461	2,183,920	96.1	1,778,482	81.4	110,631	P M	362,224 342,512	12,159 119,263	11,396 115,823	12,631 133,021	5,642 154,244
"	N. H.	"	1,230,788	2,462,711	99.9	2,272,702	92.2	301,185	P M	106,787 173,406	19,116 83,207	14,384 117,618	24,022 209,057	9,370 325,281
"	Vt.	"	183,676	736,484	92.2	579,729	78.7	11,247	P M	91,345 95,984	12,976 114,057	5,750 14,316	6,963 60,975	6,389 51,816
"	N. Y.	"	728,984	2,215,357	99.2	1,913,535	86.3	68,390	P M	122,671 413,548	49,213 368,667	30,613 367,067	37,849 337,573	33,269 383,717
"	Mass.	"	590,489	1,430,216	99.9	1,377,121	96.2	785,401	P M	33,808 229,724	6,169 50,290	2,875 28,587	5,502 87,141	3,469 44,631
"	Conn.	"	102,363	466,376	100.0	466,376	100.0	316,823	P M	- 25,512	24,794	25,503	44,367	29,377
"	R. I.	"	64,018	147,778	100.0	147,778	100.0	147,778	P M	Only cursory examinations scheduled				
"	N. J.	"	3,771	16,742	100.0	16,742	100.0	16,742	P M	Only cursory examinations scheduled				
"	Pa.	"	105,485	468,430	99.4	444,283	94.8	17,412	P M	4,982 147,507	1,640 64,364	7,800 74,239	9,475 90,251	3,495 89,426
"	Del.	"	242	6,186	100.0	6,186	100.0	6,186	P M	Only cursory examinations scheduled				
"	Md.	"	70,884	165,046	100.0	152,444	92.3	54,553	P M	5,495	1,413 3,591	2,665	1,399	845
"	W. Va.	"	237,847	488,731	99.9	437,024	89.4	135,571	P M	375 2,905	19,823 61,578	6,340 43,061	7,759 21,872	3,419 48,961
"	Va.	"	540,818	1,477,948	99.3	1,418,307	96.0	597,560	P M	8,879 126,568	12,236 91,456	4,298 68,705	2,672 68,444	825 61,750
"	Ky.	"	31,199	114,312	100.0	114,312	100.0	114,282	P M	Only cursory examinations scheduled				
R-8	Tenn.	"	465,679	1,065,663	100.0	1,059,189	99.4	1,042,155	P M	1,900	1,000	4,000 400	300 150	500 600
R-8	N. C.	"	582,972	1,370,092	99.9	1,364,761	99.6	1,361,790	P M	3,000 1,000	1,500 500	1,000 500	750 500	500 500
R-8	S. C.	"	45,398	77,008	100.0	77,008	100.0	77,008	P M	Only cursory examinations scheduled				
R-8	Ga.	"	248,576	324,452	100.0	324,302	99.9	324,302	P M	Only cursory examinations scheduled				
	Sub-Totals S & P		6,161,650	15,217,452	98.8	13,950,281	91.6	5,489,016	P M	741,466 1,558,666	137,245 981,767	91,121 855,819	109,322 1,053,351	67,723 1,190,303

@ P = Premaintenance
M = Maintenance

(Continued)

STATUS OF WHITE PINE BLISTER RUST CONTROL

BY LAND OWNERSHIP - REGIONS 7 - 8

SEPTEMBER 30, 1958

TABLE 6 Continued

State	Ownership	NET CONTROL ACREAGE: White Pine	Control Area	% Initial Worked	On Maintenance	% On Maintenance	Ribes-Free Or Low Hazard	@	PROJECTED WORK LOAD ACREAGE: 1959	1960	1961	1962	1963
					National Forests								
R-7 Me.	White Mtn.	974	2,252	100.0	2,252	100.0	-	P M	 120			 1,044	
R-7 N. H.	White Mtn.	1,527	3,760	100.0	3,760	100.0	-	P M		 100	 270	 2,429	 926
R-7 Vt.	Green Mtn.	544	2,308	100.0	2,308	100.0	-	P M				 656	 453
R-7 Pa.	Allegheny	1,037	4,475	94.6	3,960	88.4	-	P M				 515 3,960	
R-7 W. Va.	Monongahela	47,779	88,894	100.0	80,297	90.3	24,607	P M	4,709 20,685	388 27	 5,528	 1,710	380 10,154
R-7 Va.	Geo. Wash.	191,500	430,461	99.7	396,069	92.0	46,459	P M	5,981 31,024	6,944 39,896	1,605 20,021	5,050 36,533	2,403 51,649
R-7 W. Va.	Geo. Wash.	42,191	71,373	100.0	60,922	85.4	4,965	P M	1,898 6,727	1,534 8,794	1,178 5,773	1,110 4,696	350 6,550
R-7 Va.	Jefferson	63,732	126,916	100.0	123,027	96.9	23,331	P M	None scheduled during period				
R-7 Ky.	Cumberland	16,980	32,002	100.0	32,002	100.0	31,927	P M	500	340	600 600		
R-8 Tenn.	Cherokee	250,171	485,686	100.0	483,164	99.4	481,863	P M	None scheduled during period				
R-8 N. C.	Nat'l Forest	136,365	230,947	99.9	227,791	98.6	226,887	P M	3,000	1,000	250 250	250 250	255 255
R-8 S. C.	Sumter	18,794	53,862	100.0	53,862	100.0	53,862	P M	Only cursory examinations scheduled				
R-8 Ga.	Chattahoochee	295,902	349,903	100.0	349,713	99.9	349,713	P M	None scheduled during period				
	Sub-Totals Nat'l Forest	1,067,496	1,882,839	96.9	1,819,127	96.6	1,243,614	P M	16,088 58,856	10,206 48,817	3,633 32,442	6,925 51,278	3,388 69,987

@ P = Premaintenance
M = Maintenance

(Continued)

STATUS OF WHITE PINE BLISTER RUST CONTROL

BY LAND OWNERSHIP - REGIONS 7 - 8

SEPTEMBER 30, 1958

TABLE 6 Continued

State	Ownership	NET CONTROL ACREAGE: White Pine	Control Area	% Initial Worked	On Maintenance	% On Maintenance	Ribes-Free Or Low Hazard	@	PROJECTED WORK LOAD ACREAGE: 1959	1960	1961	1962	1963
						National Parks							
R-7 Maine	Acadia	3,500	17,318	100.0	17,318	100.0	-	P					
								M	9,470	-	-	-	-
R-7 N.Y.	Saratoga Battlefield	135	1,450	100.0	1,237	85.3	-	P					13
								M					1,237
R-7 Va.	Shenandoah	3,080	14,270	100.0	14,270	100.0	-	P					
								M	2,190	2,147	2,265	1,319	2,004
R-7 Va.	Blue Ridge	415	1,780	100.0	343	19.2	-	P			651		
								M			154		
R-8 N. C.	Blue Ridge	5,627	11,883	100.0	11,761	98.9	11,761	P					
								M		122			
R-8 Tenn.	Great Smoky	54,268	79,752	100.0	79,752	100.0	79,752	P	Only cursory examinations scheduled				
								M					
R-8 N. C.	Great Smoky	11,802	30,239	100.0	30,239	100.0	-	P	None scheduled during period				
								M					
	Sub-Total Nat'l Parks	78,827	156,692	99.9	154,920	98.8	91,513	P	-	122	651	-	13
								M	11,660	2,147	2,419	1,319	3,241
						Indian Lands							
R-8 N. C.	Cherokee	22	445	100.0	445	100.0	445	P	Only cursory examinations scheduled				
								M					
	Grand Totals	7,307,995	17,257,428	99.0	15,924,773	92.3	6,824,588	P	757,554	147,573	95,405	116,247	71,124
								M	1,629,182	1,032,731	890,680	1,105,948	1,263,531
					Summarized By Regions and Ownership								
						Region 7							
	State and Private	4,819,025	12,380,237	98.6	11,125,021	89.2	2,683,761	P	736,566	134,745	86,121	108,272	66,723
								M	1,557,666	981,267	854,919	1,052,701	1,189,203
	National Forests	366,264	762,441	99.5	704,597	92.4	131,289	P	13,088	9,206	3,383	6,675	3,133
								M	58,856	48,817	32,192	51,028	69,732
	National Parks	7,130	34,818	99.9	33,168	95.2	-	P			651		13
								M	11,660	2,147	2,419	1,319	3,241
	Sub-Total R-7	5,192,419	13,177,496	98.6	11,862,786	90.0	2,815,050	P	749,654	143,951	90,155	114,947	69,869
								M	1,628,182	1,032,231	889,530	1,105,048	1,262,176
						Region 8							
	State and Private	1,342,625	2,837,215	99.9	2,825,260	99.6	2,805,255	P	4,900	2,500	5,000	1,050	1,000
								M	1,000	500	900	650	1,100
	National Forests	701,232	1,120,398	99.9	1,114,530	99.4	1,112,325	P	3,000	1,000	250	250	255
								M			250	250	255
	National Parks	71,697	121,874	100.0	121,752	99.8	91,513	P	-	122	-	-	-
								M					
	Indian Lands	22	445	100.0	445	100.0	445	P	Only cursory examinations scheduled				
								M					
	Sub-Total R-8	2,115,576	4,079,932	99.9	4,061,987	99.5	4,009,538	P	7,900	3,622	5,250	1,300	1,255
								M	1,000	500	1,150	900	1,355
	Grand Totals	7,307,995	17,257,428	99.0	15,924,773	92.3	6,824,588	P	757,554	147,573	95,405	116,247	71,124
								M	1,629,182	1,032,731	890,680	1,105,948	1,263,531

@ P = Premaintenance
M = Maintenance

Table 7 - Local Cooperation On Blister Rust Control

State	No. of Cooperators			Amount Expended			
	Individuals	Towns	Counties	Individuals	Towns	Counties	Total
Me.	3	80	-	560	21,404	-	21,964
N. H.	-	92	-	-	24,872	-	24,872
Vt.	-	24	-	-	5,176	-	5,176
Conn.	1	2	-	441	1,300	-	1,741
N. Y.	-	-	16	-	-	21,903	21,903
Sub-Total R-7	4	198	16	1,001	52,752	21,903	75,656
N. Car. R-8	1	-	-	47	-	-	47
ALL	5	198	16	1,048	52,752	21,903	75,703

TABLE 8 — BRC FEDERAL EXPENDITURES — CALENDAR YEAR 1958

STATE FOREST OR PARK	FISCAL YEAR	LANDS	720 LEADER-SHIP	411 S & P	042 NAT'L FORESTS	NAT'L PARKS	TOTAL FEDERAL	TOTAL STATE & LOCAL	GRAND TOTAL
				REGION-7					
ME	1958	S & P	$ 17,825	$ 10,007	$	$	$ 27,832	$ 16,062	$ 43,894
	1959	S & P	14,683	10,154			24,837	26,264	51,101
	TOTAL		32,508	20,161			52,669	42,326	94,995
N. H.	1958	S & P	21,720	14,077			35,797	20,683	56,480
WHITE MTN.		N.F.	244				244		244
	1959	S & P	18,120	7,637			25,757	22,833	48,590
" "		N.F.	59	—	308		367		367
	TOTAL	S & P	39,840	21,714			61,554	43,516	105,070
		N. F.	303	—	308		611		611
VT.	1958	S & P	10,374	6,052			16,426	14,303	30,729
	1959	S & P	9,788	4,202			13,990	7,262	21,252
	TOTAL	S & P	20,162	10,254			30,416	21,565	51,981
MASS.	1958	S & P	5,762	2,490			8,252	8,044	16,296
	1959	S & P	5,112	948			6,060	4,599	10,659
	TOTAL		10,874	3,438			14,312	12,643	26,955
CONN.	1958	S & P	1,242	714			1,956	11,224	13,180
	1959	S & P	530	310			840	4,894	5,734
	TOTAL		1,772	1,024			2,796	16,118	18,914
N. Y.	1958	S & P	28,784	14,499			43,283	117,220	160,503
SARATOGA		N. P.	162			133	295		295
	1959	S & P	24,864	14,768			39,632	66,929	106,561
	TOTAL	S & P	53,648	29,267			82,915	184,149	267,064
	"	N. P.	162			133	295		295
PA.	1958	S & P	10,175	2,542			12,717	17,155	29,872
ALLEG.		N. F.	302				302		302
	1959	S & P	10,136	1,112			11,248	6,384	17,632
		N. F.	126		683		809		809
	TOTAL	S & P	20,311	3,654			23,965	23,539	47,504
		N. F.	428		683		1,111		1,111
MD.	1958	S & P	341	334			675	2,018	2,693
	1959	S & P	357				357		357
	TOTAL		698	334			1,032	2,018	3,050
W. VA.	1958	S & P	2,758	7,367			10,125	15,725	25,850
G. W.		N. F.	1,380		5,144		6,524		6,524
MONG.		N. F.	1,379		1,728		3,107		3,107
	1959	S & P	8,296	3,019			11,315	9,000	20,315
G. W.		N. F.	2,740		923		3,663		3,663
MONG.		N. F.	2,286		1,080		3,366		3,366
	TOTAL	S & P	11,054	10,386			21,440	24,725	46,165
		N. F.	7,785		8,875		16,660		16,660
VA.	1958	S & P	635	2,422			3,057	7,452	10,509
G. W.		N. F.	501		5,837		6,338		6,338
JEFF.		N. F.	501		2,406		2,907		2,907
BLUE RIDGE		N. P.	35			2,790	2,825		2,825
	1959	S & P	8,028	1,176			9,204	3,685	12,889
G. W.		N. F.	2,901		8,705		11,606		11,606
JEFF.		N. F.	2,431		1,351		3,782		3,782
BLUE RIDGE		N. P.	12			345	357		357
	TOTAL	S & P	8,663	3,598			12,261	11,137	23,398
		N. F.	6,334		18,299		24,633		24,633
		N. P.	47			3,135	3,182		3,182

 (CONTINUED ON PAGE 11)

TABLE 8 (CONTINUED) — BRC FEDERAL EXPENDITURES — CALENDAR YEAR 1958

STATE FOREST OR PARK	FISCAL YEAR	LANDS	720 LEADER-SHIP	411 S & P	042 NAT'L FORESTS	NAT'L PARKS	TOTAL FEDERAL	TOTAL STATE & LOCAL	GRAND TOTAL
KY.	1958	N. F.	$ 78	$	$	$	$ 78	$	$ 78
CUMB.	1959	N. F.	25				25		25
	TOTAL		103				103		103
SUB-	1958	S & P	128,033	60,504			188,537	229,886	418,423
TOTAL		N. F.	4,385		15,115		19,500		19,500
REG. 7		N. P.	197			2,923	3,120		3,120
	1959	S & P	71,497	43,326			114,823	151,850	266,673
		N. F.	10,568		13,050		23,618		23,618
		N. P.	12			345	357		357
		S & P	199,530	103,830			303,360	381,736	685,096
TOTALS		N. F.	14,953		28,165		43,118		43,118
REG. 7		N. P.	209			3,268	3,477		3,477
				REGION — 8					
TENN.	1958	S & P						300	300
CHEROKEE		N. F.	102				102		102
"	1959	N. F.	10				10		10
	TOTAL	S & P						300	300
		N. F.	112				112		112
N. C.	1958	S & P		1,000			1,000	4,823	5,823
N.C-N.F.		N. F.	176		697		873		873
GR. SMOKY		N. P.				1,352	1,352		1,352
	1959	S & P	89				89		89
		N. F.	31				31		31
		N. P.				2,706	2,706		2,706
	TOTAL	S & P	89	1,000			1,089	4,823	5,912
		N. F.	207		697		904		904
		N. P.				4,058	4,058		4,058
SUB-		S & P	89	1,000			1,089	5,123	6,212
TOTAL		N. F.	319		697		1,016		1,016
REG. 8		N. P.				4,058	4,058		4,058
TOTAL REG. 8			408	1,000	697	4,058	6,163	5,123	11,286
		S & P	199,619	104,830			304,449	386,859	691,308
ALL		N. F.	15,272		28,862		44,134		44,134
		N. P.	209			7,326	7,535		7,535
GRAND TOTAL			$215,100	$104,830	$28,862	$7,326	$356,118	$386,859	$742,977

TABLE 9 — BRC COOPERATORS EXPENDITURES — CALENDAR YEAR — 1958

STATE	FISCAL YEAR	STATE DIRECT AID	INDIVIDUAL	TOWNS	COUNTIES	TOTAL DIRECT AID	INDIRECT AID	TOTAL STATE & LOCAL
ME.	1958	$ 8,191	$ 560	$ 6,561	$	$ 15,312	$ 750	$ 16,062
	1959	11,171	—	14,843		26,014	250	26,264
TOTAL		19,362	560	21,404	—	41,326	1,000	42,326
N. H.	1958	12,825		7,498		20,323	360	20,683
	1959	5,293		17,374		22,667	166	22,833
TOTAL		18,118	—	24,872	—	42,990	526	43,516
VT.	1958	10,951		2,227		13,178	1,125	14,303
	1959	3,938		2,949		6,887	375	7,262
TOTAL		14,889	—	5,176	—	20,065	1,500	21,565
MASS.	1958	7,669				7,669	375	8,044
	1959	4,474				4,474	125	4,599
TOTAL		12,143	—	—	—	12,143	500	12,643
CONN.	1958	10,350	441	208		10,999	225	11,224
	1959	3,727	—	1,092		4,819	75	4,894
TOTAL		14,077	441	1,300	—	15,818	300	16,118
N. Y.	1958	102,240			11,395	113,635	3,585	117,220
	1959	55,226			10,508	65,734	1,195	66,929
TOTAL		157,466	—	—	21,903	179,369	4,780	184,149
PA.	1958	15,175				15,175	1,980	17,155
	1959	5,724				5,724	660	6,384
TOTAL		20,899	—	—	—	20,899	2,640	23,539
MD.	1958	1,868				1,868	150	2,018
	1959	—				—	—	—
TOTAL		1,868	—	—	—	1,868	150	2,018
W. VA.	1958	15,500				15,500	225	15,725
	1959	8,925				8,925	75	9,000
TOTAL		24,425	—	—	—	24,425	300	24,725
VA.	1958	6,027				6,027	1,425	7,452
	1959	3,210				3,210	475	3,685
TOTAL		9,237	—	—	—	9,237	1,900	11,137
SUB-TOTAL	1958	190,796	1,001	16,494	11,395	219,686	10,200	229,886
	1959	101,688	—	36,258	10,508	148,454	3,396	151,850
TOTAL R-7		292,484	1,001	52,752	21,903	368,140	13,596	381,736
TENN.	1958	300				300	—	300
	1959	—				—	—	
TOTAL		300	—	—	—	300	—	300
N. C.	1958	3,926	47			3,973	850	4,823
	1959	—	—			—	—	—
TOTAL		3,926	47	—	—	3,973	850	4,823
SUB-TOTAL	1958	4,226	47	—	—	4,273	850	5,123
	1959	—	—	—	—	—	—	—
TOTAL R-8		4,226	47	—	—	4,273	850	5,123
TOTAL R-7&8	1958	195,022	1,048	16,494	11,395	223,959	11,050	235,009
	1959	101,688	—	36,258	10,508	148,454	3,396	151,850
ALL		$296,710	$1,048	$52,752	$21,903	$372,413	$14,446	$386,859

R-9

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

ANNUAL REPORT

FOREST PEST CONTROL

NORTH CENTRAL REGION

CALENDAR YEAR 1958

Division of State & Private Forestry
Forest Pest Control Section
In Cooperation With
Federal, State, County and Local Agencies

Milwaukee, Wisconsin
February, 1959

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ANNUAL REPORT

FOREST PEST CONTROL

NORTH CENTRAL REGION

CALENDAR YEAR - 1958

ORGANIZATION

The overall organization of the Forest Pest Control Section remained unchanged this year, with the exception of the Chippewa and Superior National Forests.

On July 1 these forests assumed full responsibility for all phases of the BRC program. Ralph Nelson, District Leader at Duluth, became a member of the Forest Supervisor's staff at that time. On the Chippewa National Forest Jacob N. Licke, District Leader, still devotes some time to control work on National Forest land, primarily to train forest personnel in BRC procedure. Staff-line responsibilities for BRC work on these two forests remain with the Forest Pest Control Section in the Regional Office. The accompanying chart shows the Forest Pest Control organization as it existed during most of 1958.

RESPONSIBILITY

The Section is concerned with cooperative forest pest control work. Under the Lea Act of 1940 and state laws, the Section is responsible for leadership, coordination and technical direction of the blister rust control program on lands of all ownerships. Under the Forest Pest Control Act of 1947 the Section carries out federal responsibilities in cooperation with the states for work on state and private lands. The function of the Section is to help create awareness of forest pest problems, and to coordinate and expedite control measures. All control work is done by authority of state laws under the direction of National Forest Supervisors for work on national forest lands, and by the responsible State agency for work on State and private lands. The Forest Pest Control Act provides for federal financial participation in cooperative forest pest control work when states request it. It is the responsibility of the Section to ascertain the biological and economic aspects of proposed projects by consulting with Forest Experiment Stations and forest managers, submitting project proposals requesting financial aid, drawing up cooperative agreements with the States, assisting them in preparing work plans, and rendering such assistance in the field and elsewhere to assure the successful operation of control projects.

White pine blister rust, a two-host parasitic fungus-caused disease, was introduced from Europe about 1900. The disease is now widespread throughout the Region, ranging from very heavy infection in the north to very light in the south. This year infection on pine was found in Floyd County, Iowa for the first time. Blister rust attacks and kills white pines. Damage is particularly severe on young growth, thus threatening the future stands of eastern white pine. The rust is controlled by the destruction of currant and gooseberry bushes (ribes), the alternate hosts for the disease.

Jack pine budworm subsided in northwestern Wisconsin and Central Minnesota. Spruce budworm was present and spreading in northern Minnesota near the Canadian border. Larch sawfly damage is increasing in the north, especially in Minnesota. Saratoga spittlebug continued to be present in plantations of jack and red pine in the three Lake States. European pine shoot moth was particularly severe in red pine plantations in lower Michigan, northern Ohio, northern Indiana and southeastern Wisconsin. The tip weevil continued to be damaging, especially in open grown plantations of white, jack, red pine and Norway spruce in the northern parts of Minnesota, Wisconsin and Michigan. It is scarce or absent in the southern part of the Region. The weevil is not severe on white pines growing under a high deciduous overstory of 40% or more density.

Oak wilt is increasing in intensity and is killing oaks, especially the red oak group. Dutch elm disease continues to spread throughout southeastern Wisconsin. To date more than 1800 diseased elms have been found and destroyed. Maple blight, a disease of unknown cause and behavior, is killing hard maple of all age classes in northeastern Wisconsin. Research work is underway to determine the cause and to provide control measures. Damage to red pine plantations in Upper Michigan is causing concern. The injury is similar to that caused by Saratoga spittlebug or frost. Studies have been started by the Experiment Station and others to find the cause of the damage.

ACCOMPLISHMENTS - 1958

The Section's main accomplishments were in the field of white pine blister rust control. However, work on the control of other forest pests was continued this year.

WHITE PINE BLISTER RUST CONTROL

Control activities were conducted in the three Lake States and in Illinois and Iowa. No work was needed in Indiana and Ohio where the rust hazard is low. Limited scouting for the rust in Indiana and Ohio in the fall of 1958 failed to find white pine infection.

Surveys

As a result of surveys, both pre-eradication and post-check, the control problem in 1958 was increased by the addition of 14,730 acres of white pine, chiefly as natural reproduction in Michigan - (Table 1).

Survey work was done principally by the permanent staff before and after the ribes eradication season.

Local Control

About 36,000 acres of white pine were protected by destroying 2½ million ribes on 69,000 acres of control area at the expense of 14,000 man-days - (Table 2).

Force account labor was used on most of the projects. Prison trusties were used effectively on State and private land in Michigan and Minnesota. Contract eradication accounted for all work on the Lower Michigan National Forest and for about one-third of the work on the Superior National Forest. The Bureau of Indian Affairs, using the contract method for the first time, successfully worked about 3,000 acres of Indian land. In Michigan 2,100 acres of private land were worked by contractors. The average price per acre paid to contractors throughout the region was $2.10.

The use of 2, 4, 5-T again accounted for the destruction of ribes in heavy concentrations and in swamp areas. All work in Illinois was done by basal stem spraying of 2,4,5-T in oil. Application of 2,4,5-T in water as a foliage spray was made in Michigan, Minnesota and Wisconsin. Power spray equipment was again used to destroy swamp ribes on the Menominee Indian Reservation.

Checking

Checking for ribes after eradication showed that satisfactory work was done on the 54,939 acres checked - (Table 2).

Canker Pruning

Cankers were removed to save 1,343 infected pines growing in protected stands, and 667 fatally infected pines were removed in Iowa, Illinois, Minnesota and Wisconsin - (Table 5).

Nursery Sanitation

Ribes were removed from around four nurseries - (Table 6). Ribes-free conditions are being maintained around 44 nurseries producing about 35 million white pine annually in the Region.

Status of Control

The total control problem in the Region consists of 1,304,963 acres of white pine, and 3,789,596 acres of control area. This is an increase of 14,730 acres of pine - (Table 4). At year's end 86% of the regional control area has been initially worked, and 48% is on maintenance.

The major problem of control is in Michigan, Wisconsin and Minnesota. Nearly all of the natural white pine, and much of the planted are in these States, and the rust is most active and prevalent here. In Ohio, Indiana and Illinois white pine is extensively planted and grows

well, often 4 feet in height per year. Due largely to hot, dry summers and early fall, rust is inhibited, and the danger of rust damage is much less than further north. The biggest problem of control in the three Lake States is in Minnesota, with only 72% initially worked, and 25% on maintenance, compared with about 88% initially worked, and 49% maintenance in Wisconsin and Michigan. In general, ribes are more abundant and eradication costs are higher in Minnesota than elsewhere in the region. Weather conditions in northeastern Minnesota are very favorable for rust development.

On the basis of ownership classes, control work is fairly well on schedule on national forests, and Indian Reservations, but lags on state and county lands, and is far behind on private lands. This is important, because of the total control acreage; 61% is private, 25% state, county and municipal, 10% is in national forests, and 4% is in Indian Reservations - (Table 4).

Work Plans

Long-range work plans for national forests, Indian Reservations, and some state forests have been prepared and are being followed. Long-range plans for other state and private lands are being prepared. These plans are valuable as a basis for advising owners, and for the orderly planning of future control activities.

Personnel Employed by Months

Of the 81.4 man-years of work, 33.8 man-years were employed on state and private funds, indicating the strong cooperative nature of the blister rust control project. (Table 7). Practically 83% of the total man-months is used for ribes eradication during the growing season, and only 17% is used the remainder of the year. During the fall and winter months the small nucleus of year-round personnel makes pre-eradication and post-check surveys, brings control records up to date, contacts pine owners, writes reports, and prepares work plans for the ensuing eradication season.

Costs

Total funds for blister rust control in 1958 were greater than in 1957. State and local contributions were $148,663, slightly higher than last year, and the highest to date - (Table 8).

Safety

Instruction in safe working practices is a standard part of the field training program. First aid kits are supplied to each field crew and are carried in each government vehicle.

Recommendations

It is recommended that:

1. Continued effort be made to interest private owners of valuable white pines to protect them against blister rust as a necessary part of white pine management.

2. Close ties with Farm and Service Foresters be established and maintained so they will be familiar with blister rust and other major forest pest control measures, and will encourage private forest owners to practice necessary forest protection.

3. Cooperative relations be maintained with other branches of the Forest Service for mutual assistance in state and private forestry. This is of special importance in view of impetus for planting and forest management in A.C.P. and Soil Bank activities.

4. Forest Pest Control personnel continue to learn more of major forest pests and their control so they may be of greater use in developing and operating cooperative forest pest control projects.

5. Forest Pest Control personnel work closely with and assist investigative units dealing with the development of resistant strains of white pine, micro-climate studies of the rust and the application of improved herbicides to destroy ribes.

6. Men be trained and encouraged to take ribes eradication contracts.

7. Contract eradication be continued and expanded on Indian Reservations.

8. Experimental work with Acti-dione be continued on all districts.

9. Grades for District Leaders be adjusted, and funds be provided for needed full-time assistants to enable District Leaders to carry out their increased job load under their added responsibilities of forest pest control.

10. Long-range work plans be reviewed and brought up to date for all national forests, Indian Reservations, State (and county) forests and State (and county) parks.

11. More intensive disease and stocking survey work be done to determine the behavior of the rust on certain problem areas and to appraise the pine values on areas prior to control work.

12. More intensive checking procedures be used, particularly on post-check and on regular check following contract eradication work.

13. National forest personnel be trained in control procedures in preparation for assumption of full responsibility for all phases of the BRC program.

14. Safety measures continue to be stressed to accomplish the goal of no accidents.

INFORMATIONAL ACTIVITIES

It is the responsibility of this Section to keep the public informed about blister rust and other forest pest control activities. Several radio appearances, talks before forestry classes, newspaper articles, blister rust control movies, show-me trips, and meetings were conducted during 1958. Many personal contacts were made by regular personnel in connection with survey work, and the development of concerted community effort in control work. The major effort is aimed at helping the pine owner help himself. Owners are being encouraged to plant white pine in areas where the rust hazard is low and tip weevil is absent.

ECONOMIC STUDY OF WHITE PINE

Field data for the economic study of eastern white pine are now being analyzed by the Washington office. Additional data concerning history, ownership and cost of prior workings were submitted this year.

RESEARCH STUDIES

Studies of micro-climate effect and the development of rust-resistant white pine have been continued by the Lake States Forest Experiment Station and the University of Wisconsin.

EXPERIMENTAL WORK WITH ACTI-DIONE

Experimental treatment with Acti-dione on 565 infected pines was done this year in Minnesota, Michigan and Wisconsin. Applications with concentrations of 100, 150 and 200 ppm were made directly to cankers, basal stem and foliage. Additional tests are being made this winter and will be continued next season to determine the effectiveness of year round treatment and to study other properties of this fungicide, such as possible translocation upward and downward in the stem, immunization and length of effectiveness of a single treatment.

STUDY OF BRC ON THE SUPERIOR

A stocking and infection survey of certain problem areas on the Superior was made last spring to determine the effectiveness of present control measures and their economic feasibility. The results of this survey are presented in a separate report.

BLISTER RUST CONTROL ON NATIONAL FORESTS

Organization of Work

On July 1 the Chippewa and Superior National Forests assumed full responsibility for all phases of the BRC program, with aid from the F.P.C. Section during the transition period. On the National Forests in Wisconsin and Michigan the organization remained the same as in previous years. National forest personnel continued to be responsible for selection of white pine stands to be protected, and for furnishing labor and crew leaders. Except on the forests in Minnesota, the

F.P.C. Section, through District Leaders, directly trained crews and supervised control work on all forests. Responsibility for preparing work plans and maps, checking on adequacy of work, maintaining records and preparing reports, remained with the Forest Pest Control Section. Close cooperation between the national forests and this Section continued.

Accomplishments

Ribes eradication work was done on all national forests in the three Lake States. Approximately one-half of the work done was re-work; one-third was initial; and the remainder was maintenance work. More than 776,000 ribes were destroyed at a cost of 3,800 man-days.

Contract work continued effectively on the Huron, Manistee and Superior National Forests. Of the 12,994 acres worked this year, 39% was done by contractors in 22 separate contracts at the average price of $1.53 per acre. (Table 3)

Pre-eradication survey and post-check work was done on all forests in the Lake States. About 3,588 acres were added to the control area.

In protected pine stands within the national forests 2,106 blister rust cankers were removed from 691 trees. (Table 5)

Status of Control

Of the 361,045 acres in the control area, 95% has been worked initially and 72% is now on maintenance. (Table 4) The work on the Superior continues to be the major control problem. There the inaccessibility of work areas, high costs of wages and camp operation, heavy concentrations of ribes and extremely favorable rust development conditions combine to make control work costly and difficult.

BLISTER RUST CONTROL ON INDIAN RESERVATIONS

Organization of Work

The Bureau of Indian Affairs is responsible for the selection of areas to be protected and the employment of Indian labor and crew leaders. The Forest Service, through the Forest Pest Control Section, has the responsibility of preparing work plans and maps, training of men, checking on adequacy of work, keeping records, and making periodic reports.

Accomplishments

This year marked the beginning of contract eradication on Indian lands. About 3,000 acres on the Nett Lake and Lac Court Oreilles Reservations were successfully worked by Indians in 36 separate contracts. Of the 7,968 acres worked, 37% was done by contractors at the average price of $4.22 per acre. (Table 3) The remainder of the work was done by force account Indian labor.

The work on the Menominee was all premaintenance; re-work and maintenance work was done on the Red Lake and Lac Court Oreilles; and only maintenance work was done on the Nett Lake Reservation.

Chemical work by power sprayer was continued on the Menominee Reservation where 2,4,5-T was applied at the rate of 1.2 ounces per gallon of water. The spray crew was composed of five Indian women who demonstrated an exceptional aptitude for this method of work.

Status of Control

Of the 141,448 acres of control area, 97% has been worked initially and 82% is now on maintenance. (Table 4). Most of the pre-maintenance work remaining is on the Menominee, Lac Court Oreilles and Red Lake Reservations. Individual reports and work plans, in detail, have been prepared and furnished each Reservation concerned.

OTHER FOREST PEST CONTROL WORK

A cooperative project with Minnesota was successfully completed for control of the spruce budworm. Twelve thousand acres were aerial sprayed and good control was obtained. Control work on national forests included spraying 4,144 acres for Saratoga spittlebug; 71 acres for red headed sawfly; 23 acres for white pine weevil and 393 acres for European pine shoot moth. The work was conducted in consultation with fish and wildlife specialists and there were no cases of adverse criticism.

The Forest Pest Control Section maintained close contact with the States, National Forest administration and the Experiment Stations to coordinate control work and keep abreast of forest insect and disease conditions.

UNITED STATES FOREST SERVICE
Regional Office Milwaukee, Wisconsin
A. W. GREELEY - Regional Forester

STATE DEPARTMENTS of AGRICULTURE AND CONSERVATION

Division of State & Private Forestry
LOUIS C. HERMEL - Chief
Forest Pest Control Section
Henry N. Putnam - Leader
John K. Kroeber - Asst. Leader, Forest Insect Control
S. Daryl Adams - Asst. Leader, Forest Disease Control

UNITED STATES BUREAU OF INDIAN AFFAIRS

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A. J. Verville -
Field Supervisor (A)
Wm. H. Munyon -
Control Aid

Superior
National Forest

Duluth, Minn.

ILLINOIS
Belvidere
E. D. Bergeson -
Control Supervisor (A)

OHIO
Columbus
No Control Supervisor
Assigned

Chippewa
National Forest

Cass Lake, Minn.

INDIANA
Indianapolis
No Control Supervisor
Assigned

(A) - Employed on State Funds

Blister Rust Control Organization, 1958

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1958

NORTH CENTRAL REGION

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $525,592,000

LOCAL CONTROL - 1958

Operating Agency	Acres Worked				Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop.	10,530	33,714	3,565	47,809	1,486,366	8,164	31	0.17
National Forests	4,074	7,234	1,686	12,994	776,198	3,823	60	0.29
Bur. Ind. Affairs	775	3,324	3,869	7,968	295,377	1,942	37	0.24
TOTAL	15,379	44,272	9,120	68,771	2,557,941	13,929	37	0.20

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	178,416	361,045	95.3	71.5	16,809	86,256	257,980
Ind. Reservations	84,044	141,448	97.2	82.4	3,896	21,051	116,501
Non-Fed. Public	389,168	961,729	89.8	46.4	97,904	417,961	445,864
Private	653,335	2,325,374	82.4	42.1	408,255	938,938	978,181
TOTAL	1,304,963	3,789,596	86.1	47.5	526,864	1,464,206	1,798,526

Blister Rust Infection, 1958: Infection found on white pine in Floyd County, Iowa. Cumulative: On pines and ribes in all seven states. Most severe in north. Rust found on pines in 209 counties; on ribes in 398 counties of the 622 counties in the seven states in the region.

Nursery Sanitation, 1958: 3 state and 1 private nurseries worked. Ribes free zones maintained around 44 nurseries producing about 35,000,000 white pine trees annually.

Canker Pruning, 1958: 3,228 cankers removed to save 1,343 infected trees; 667 fatally infected trees were removed. Canker pruning was done in Iowa, Illinois, Minnesota and Wisconsin.

Surveying, 1958: 28,076 acres control area initially surveyed; 85,734 acres post-checked and decreased to 84,956 acres. White pine in regional control area was increased this year by 14,730 acres.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1958

ILLINOIS

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $2,000,000

LOCAL CONTROL - 1958

Operating Agency	Acres Worked				Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop.	-	1,248	-	1,248	22,390	52	18	0.04
National Forests	-	-	-	-	-	-	-	-
Bur. Ind. Affairs	-	-	-	-	-	-	-	-
TOTAL	-	1,248	-	1,248	22,390	52	18	0.04

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	-	-	-	-	-	-	-
Ind. Reservations	-	-	-	-	-	-	-
Non-Fed. Public	1,672	7,761	98.7	31.9	98	5,187	2,476
Private	1,095	5,896	91.4	25.0	505	3,912	1,479
TOTAL	2,767	13,657	95.6	28.9	603	9,099	3,955

Blister Rust Infection, 1958: No additional counties this year. On white pine in 15 counties, on ribes in 30 counties.

Nursery Sanitation, 1958: Mason State Nursery worked.

Canker Pruning, 1958: One area treated, three cankers removed from 3,000 examined.

Surveying, 1958: Post-check on 367 acres of control area with 60 acres white pine.

Checking After Eradication, 1958: No checking performed since chemical application was made on all work areas.

MILWAUKEE, WIS. 1958

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1958

INDIANA

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $7,000,000

LOCAL CONTROL - 1958

NONE

Operating Agency	Acres Worked				Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop. National Forests Bur. Ind. Affairs								
TOTAL								

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	18	179	100.0	100.0	-	-	179
Ind. Reservations	-	-	-	-	-	-	-
Non-Fed. Public	3,169	18,209	95.1	86.3	887	1,599	15,723
Private	7,560	74,196	83.5	68.8	12,213	10,970	51,013
TOTAL	10,747	92,584	85.8	72.3	13,100	12,569	66,915

Blister Rust Infection, 1958: No new counties. Cumulative: On white pine in 3 northern counties; on ribes in 53 of the 92 counties in the State.

Nursery Sanitation, 1958: None. Cumulative: Ribes-free zones maintained around 3 nurseries.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1958

IOWA

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $5,000,000

LOCAL CONTROL - 1958

Operating Agency	Acres Worked				Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop.	-	425	-	425	25,133	187	59	0.44
National Forests	-	-	-	-	-	-	-	-
Bur. Ind. Affairs	-	-	-	-	-	-	-	-
TOTAL	-	425	-	425	25,133	187	59	0.44

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	-	-	-	-	-	-	-
Ind. Reservations	50	500	100.0	100.0	-	-	500
Non-Fed. Public	627	3,818	100.0	50.4	-	1,892	1,926
Private	2,485	10,551	88.1	45.8	1,260	4,457	4,834
TOTAL	3,162	14,869	91.5	48.8	1,260	6,349	7,260

Blister Rust Infection, 1958: Found for the first time on white pine in Floyd County. Cumulative: On white pine in 13 counties in northeastern Iowa, on ribes in 56 of the 99 counties.

Nursery Sanitation, 1958: No Nursery Sanitation performed in 1958. Cumulative: Nine nurseries with protective zones.

Canker Pruning, 1958: 8 areas containing 7,800 white pine examined. 10 cankers removed from 9 trees. 7 fatally infected trees removed.

Surveying, 1958: 2 areas, totaling 425 acres including 75 acres of white pine examined previous to reworking.

Cultivated Black Currant Eradication, 1958: Cumulative: 1,615 plantings containing 7,340 plants found and 1,608 plantings containing 7,316 plants destroyed.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1958

MICHIGAN

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $178,987,000

LOCAL CONTROL - 1958

Operating Agency	Acres Worked				Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop.	4,650	25,847	475	30,972	596,131	3,588	19	0.12
National Forests	3,065	4,040	90	7,195	265,898	759	37	0.11
Bur. Ind. Affairs	-	-	-	-	-	-	-	-
TOTAL	7,715	29,887	565	38,167	862,029	4,347	23	0.11

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	83,316	203,958	97.5	76.3	5,140	43,191	155,627
Ind. Reservations	-	-	-	-	-	-	-
Non-Fed. Public	161,855	347,735	91.9	52.6	27,981	136,817	182,937
Private	232,128	748,859	84.7	36.2	114,487	363,655	270,717
TOTAL	477,299	1,300,552	88.7	46.8	147,608	543,663	609,281

Blister Rust Infection, 1958: No new counties. Cumulative: On pines in 55 counties; on ribes in all 83 counties in the state.

Nursery Sanitation, 1958: None. Cumulative: Ribes-free zones maintained around 9 nurseries.

Canker Pruning, 1958: 1,900 cankers removed to save 630 trees; 450 fatally infected trees removed.

Surveying, 1958: 20,187 acres control area initially surveyed; 42,597 acres post-checked, and decreased to 40,965 acres. Total control area increased by 17,140 acres.

Checking After Eradication, 1958: 37,027 acres checked for ribes after eradication, and all found satisfactory.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1958

MINNESOTA

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $40,500,000

LOCAL CONTROL - 1958

Operating Agency	Acres Worked				Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop.	589	1,248	800	2,637	399,872	1,768	152	0.67
National Forests	1,009	844	289	2,142	175,647	1,510	82	0.70
Bur. Ind. Affairs	-	244	510	754	33,100	561	44	0.74
TOTAL	1,598	2,336	1,599	5,533	608,619	3,839	109	0.69

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	47,441	70,576	87.4	55.5	8,896	22,495	39,185
Ind. Reservations	20,487	30,827	93.8	74.5	957	6,911	22,959
Non-Fed. Public	57,805	118,867	58.9	16.7	48,813	50,155	19,899
Private	106,329	309,259	70.4	16.6	91,291	166,592	51,376
TOTAL	232,062	529,529	71.7	25.2	149,957	246,153	133,419

Blister Rust Infection, 1958: No new counties. Cumulative: On pines in 41 counties, on ribes in 40 of the 87 counties in the State. Rust prevalent in all pine-growing counties, especially severe in northeastern Minnesota.

Nursery Sanitation, 1958: None. Cumulative: Ribes-free zones maintained around two nurseries.

Canker Pruning, 1958: 1 area treated. 1,109 cankers removed to save 643 trees; 387 fatally infected trees removed.

Surveying, 1958: 25 areas containing 2,324 acres of control area including 865 acres of white pine surveyed initially. Post-check survey on 96 areas containing 79,004 acres of control area and 10,140 acres of white pine, a reduction in pine acreage of 3,553 acres. 8,704 acres do not need rework at this time, and 3,902 acres were put on maintenance.

Checking After Eradication, 1958: Of the 5,533 acres worked, 4,407 acres were systematically checked and meet control standards.

Control Area Permits, 1958: 61 applications for currant and gooseberry planting permits were received, 49 permits issued, 9 requests voluntarily canceled, 3 refused.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1958

OHIO

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $14,000,000

LOCAL CONTROL - 1958

NONE

Operating Agency	Acres Worked				Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop. National Forests Bur. Ind. Affairs								
TOTAL								

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	515	4,029	100.0	100.0	-	-	4,029
Ind. Reservations	-	-	-	-	-	-	-
Non-Fed. Public	8,787	33,693	87.7	63.6	4,131	8,125	21,437
Private	13,414	97,974	94.7	84.6	5,201	9,882	82,891
TOTAL	22,716	135,696	93.1	79.9	9,332	18,007	108,357

Blister Rust Infection, 1958: No new counties. Cumulative: On pines in 11 counties; on ribes in 65 of the 88 counties in the State.

Nursery Sanitation, 1958: None. Cumulative: Ribes-free zones maintained around 7 nurseries.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1958

WISCONSIN

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $278,105,000

LOCAL CONTROL - 1958

Operating Agency	Acres Worked				Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop.	5,291	4,946	2,290	12,527	442,840	2,569	35	0.21
National Forests	-	2,350	1,307	3,657	334,653	1,554	92	0.42
Bur. Ind. Affairs	775	3,080	3,359	7,214	262,277	1,381	36	0.19
TOTAL	6,066	10,376	6,956	23,398	1,039,770	5,504	44	0.24

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	47,126	82,303	96.6	71.6	2,773	20,570	58,960
Ind. Reservations	63,507	110,121	97.3	84.5	2,939	14,140	93,042
Non-Fed. Public	155,253	431,646	96.3	46.7	15,994	214,186	201,466
Private	290,324	1,078,639	83.0	47.8	183,298	379,470	515,871
TOTAL	556,210	1,702,709	88.0	51.1	205,004	628,366	869,339

Blister Rust Infection, 1958: Weather conditions about average for spread of rust in northern half of state.

Cumulative: Rust on both white pine and ribes has been found in all 71 counties.

Surveying, 1958: Pre-eradication: 1,347 acres of white pine and 5,565 acres of control.

Post-check: 7,563 acres of white pine and 24,195 acres of control area.

Nursery Sanitation, 1958: 3 nurseries were worked: Gordon and Hayward (State), and Nekoosa-Edwards (Private).

Cumulative: Sanitation zones are maintained at 12 nurseries producing about 20,000,000 white pines.

Checking After Eradication, 1958: A total of 16,673 acres worked were checked for ribes and found satisfactory.

Canker Pruning, 1958: One area was treated, 7,101 trees examined, 283 trees removed, and 2,106 cankers pruned.

Control Area Permits, 1958: 220 applications were received and approval given to 207; one was cancelled and 12 refused.

TABLE 1

SURVEYS PERFORMED IN NORTH CENTRAL REGION

Calendar Year 1958

State	Type of Survey	No. of Areas Mapped	Acres Mapped Previously: White Pine	Acres Mapped Previously: Control Area	Total Acres Mapped, Net: White Pine	Total Acres Mapped, Net: Control Area	Man-Days Used
Illinois	Pre-eradication	-	-	-	-	-	-
	Post-check	3	60	367	62	367	3
	Total	3	60	367	62	367	3
Iowa	Pre-eradication	-	-	-	-	-	-
	Post-check	2	75	425	75	425	7
	Total	2	75	425	75	425	7
Michigan	Pre-eradication	129	1020	1415	10258	20187	110
	Post-check	123	20373	42597	23325	40965	140
	Total	252	21393	44012	33583	61152	250
Minnesota	Pre-eradication	25	-	-	865	2324	41
	Post-check	96	13693	21800	10140	19004	501
	Total	121	13693	21800	11005	21328	542
Wisconsin	Pre-eradication	26	-	-	1347	5565	19
	Post-check	82	6527	20545	7563	24195	179
	Total	108	6527	20545	8910	29760	198
Region	Pre-eradication	180	1020	1415	12470	28076	170
	Post-check	306	40728	85734	41165	84956	830
	Total	486	41748	87149	53635	113032	1000

TABLE 2.

SUMMARY OF LOCAL CONTROL BY STATES AND OWNERSHIP CLASSES
NORTH CENTRAL REGION - 1958

State	Ownership Class	Workings	Number of Areas Worked	Acres		Man Days Used	Ribes Destroyed	Checking Summary		Contract Eradication	
				White Pine Protected	Control Area Worked			Acres Worked and Checked	Acres Meeting Standard	Acres Worked	Average Price Per Acre Paid To Contractor
ILLINOIS	Non-Federal Public	Rework	9	300	992	15	2,225	-	-	-	-
	Private	Rework	2	63	256	37	20,165	-	-	-	-
	Total	Rework	11	363	1,248	52	22,390	* -	* -	-	-
IOWA	Non-Federal Public	Rework	2	75	425	187	25,133	-	-	-	-
MICHIGAN	National Forests	All	31	3,376	7,195	759	265,898	7,195	7,195	3,275	$0.79
	Non-Federal Public	Initial	9	1,458	2,650	394	63,703				
		Rework	26	7,065	10,632	1,122	292,032				
		Maint.	2	180	475	11	550				
		All	37	8,703	13,757	1,527	356,285	13,102	13,102	-	-
	Private	Initial	9	1,078	2,000	456	58,643				
		Rework	43	7,701	15,215	1,605	181,203				
		All	52	8,779	17,215	2,061	239,846	16,730	16,730	2,140	0.14
	Total	Initial	28	3,821	7,715	1,102	229,583				
		Rework	89	16,827	29,887	3,229	630,930				
		Maint.	3	210	565	16	1,516				
		All	120	20,858	38,167	4,347	862,029	37,027	37,027	5,415	0.53
MINNESOTA	National Forests	All	32	1,443	2,142	1,510	175,647	2,142	2,142	548	6.00
	Indian Reservations	All	10	627	754	561	33,100	581	581	227	5.85
	Non-Federal Public	Initial	10	237	509	377	121,872				
		Rework	20	622	1,130	1,083	260,035				
		Maint.	4	635	680	146	6,629				
		All	34	1,494	2,319	1,606	388,536	1,446	1,446	-	-
	Private	Initial	4	31	80	31	8,285				
		Rework	1	62	118	86	3,029				
		Maint.	1	113	120	45	22				
		All	6	206	318	162	11,336	238	238	-	-
	Total	Initial	30	981	1,598	1,280	251,404				
		Rework	40	1,369	2,336	1,839	323,748				
		Maint.	12	1,420	1,599	720	33,467				
		All	82	3,770	5,533	3,839	608,619	4,407	4,407	775	5.96
WISCONSIN	National Forests	All	12	1,896	3,657	1,554	334,653	1,550	1,550	-	-
	Indian Reservations	All	19	3,792	7,214	1,381	262,277	7,194	7,194	2,759	4.08
	Non-Federal Public	Initial	4	683	1,376	617	96,487				
		Rework	21	2,163	4,946	1,243	171,457				
		Maint.	4	1,220	2,290	349	26,574				
		All	29	4,066	8,612	2,209	294,518	4,269	4,269	-	-
	Private	Initial	15	871	3,915	360	148,322	492	492	-	-
	Total	Initial	23	1,974	6,066	1,185	294,066				
		Rework	36	5,040	10,376	3,040	470,455				
		Maint.	16	3,611	6,956	1,279	275,249				
		All	75	10,625	23,398	5,504	1,039,770	13,505	13,505	2,759	4.08
NORTH CENTRAL REGION	National Forests	Initial	26	1,998	4,074	1,124	228,484				
		Rework	42	3,751	7,234	2,009	425,562				
		Maint.	7	966	1,686	690	122,152				
		All	75	6,715	12,994	3,823	776,198	10,887	10,887	3,823	1.53
	Indian Reservations	Initial	4	420	775	208	49,257				
		Rework	12	1,872	3,324	960	91,815				
		Maint.	13	2,127	3,869	774	154,305				
		All	29	4,419	7,968	1,942	295,377	7,775	7,775	2,986	4.22
	Non-Federal Public	Initial	23	2,378	4,535	1,388	282,062				
		Rework	78	10,225	18,125	3,650	750,882				
		Maint.	10	2,035	3,445	506	33,753				
		All	111	14,638	26,105	5,544	1,066,697	18,817	18,817	-	-
	Private	Initial	28	1,980	5,995	847	215,250				
		Rework	46	7,826	15,589	1,728	204,397				
		Maint.	1	113	120	45	22				
		All	75	9,919	21,704	2,620	419,669	17,460	17,460	2,140	0.14
	Region Total	Initial	81	6,776	15,379	3,567	775,053				
		Rework	178	23,674	44,272	8,347	1,472,656				
		Maint.	31	5,241	9,120	2,015	310,232				
		All	290	35,691	68,771	13,929	2,557,941	54,939	54,939	8,949	2.10

USDA SCS MILWAUKEE WIS 1958

* All chemical eradication. No check will be made until following spring.

TABLE 3

SUMMARY OF LOCAL CONTROL ON FEDERAL LAND
NORTH CENTRAL REGION - 1958

Ownership	National Forest or Indian Reservation	Workings	Number of Areas Worked	Acres		Man Days Used	Ribes Destroyed	Checking Summary		Contract Eradication	
				White Pine Protected	Control Area Worked			Acres Worked and Checked	Acres Meeting Standard	Acres Worked	Average Price Per Acre Paid To Contractor
NATIONAL FORESTS	Huron, Mich.	Initial	7	920	1,625	77	35,854				
		Rework	2	650	825	22	5,493				
		All	9	1,570	2,450	99	41,347	2,450	2,450	2,450	$0.72
	Manistee, Mich.	Rework	7	365	735	40	7,845				
		Maint.	1	30	90	5	966				
		All	8	395	825	45	8,811	825	825	825	0.99
	Hiawatha, Mich.	Initial	3	365	1,440	175	71,383				
		Rework	2	196	495	39	27,779				
		All	5	561	1,935	214	99,162	1,935	1,935	-	-
	Ottawa, Mich.	Rework	9	850	1,985	401	116,578	1,985	1,985	-	-
	All National Forests in Michigan	All	31	3,376	7,195	759	265,898	7,195	7,195	3,275	0.79
	Superior, Minn.	Initial	16	713	1,009	872	121,247				
		Rework	7	379	490	274	16,339				
		Maint.	1	110	149	59	4,028				
		All	24	1,202	1,648	1,205	141,614	1,648	1,648	548	6.00
	Chippewa, Minn.	Rework	7	156	354	182	24,677				
		Maint.	1	85	140	123	9,356				
		All	8	241	494	305	34,033	494	494	-	-
	All National Forests in Minnesota	All	32	1,443	2,142	1,510	175,647	2,142	2,142	548	6.00
	Chequamegon, Wis.	Rework	6	565	1,440	835	220,501				
		Maint.	4	741	1,307	503	107,802				
		All	10	1,306	2,747	1,338	328,303	640	640	-	-
	Nicolet, Wis.	Rework	2	590	910	216	6,350	910	910	-	-
	All National Forests in Wisconsin	All	12	1,896	3,657	1,554	334,653	1,550	1,550	-	-
	National Forest Total	Initial	26	1,998	4,074	1,124	228,484				
		Rework	42	3,751	7,234	2,009	425,562				
		Maint.	7	966	1,686	690	122,152				
		All	75	6,715	12,994	3,823	776,198	10,887	10,887	3,823	1.53
INDIAN RESERVATIONS	Red Lake, Minn.	Rework	5	150	244	214	19,668				
		Maint.	2	92	89	129	8,051				
		All	7	242	333	343	27,719	160	160	77	6.05
	Nett Lake, Minn.	Maint.	3	385	421	218	5,381	421	421	150	5.75
	All Indian Reservations in Minnesota	All	10	627	754	561	33,100	581	581	227	5.85
	Lac Court Oreilles, Wis.	Rework	2	142	420	70	26,729				
		Maint.	8	1,650	3,359	427	140,873				
		All	10	1,792	3,779	497	167,602	3,779	3,779	2,759	4.08
	Menominee, Wis.	Initial	4	420	775	208	49,257				
		Rework	5	1,580	2,660	676	45,418				
		All	9	2,000	3,435	884	94,675	3,415	3,415	-	-
	All Indian Reservations in Wisconsin	All	19	3,792	7,214	1,381	262,277	7,194	7,194	2,759	4.08
	Indian Reservation Total	Initial	4	420	775	208	49,257				
		Rework	12	1,872	3,324	960	91,815				
		Maint.	13	2,127	3,869	774	154,305				
		All	29	4,419	7,968	1,942	295,377	7,775	7,775	2,986	4.22
ALL FEDERAL	All Federal	Initial	30	2,418	4,849	1,332	277,741				
		Rework	54	5,623	10,558	2,969	517,377				
		Maint.	20	3,093	5,555	1,464	276,457				
		All	104	11,134	20,962	5,765	1,071,575	18,662	18,662	6,809	2.71

USDA SCS MILWAUKEE WIS 1958

TABLE 4

STATUS OF CONTROL BY OWNERSHIP CLASSES, NORTH CENTRAL REGION, ON DECEMBER 31, 1958

Ownership	National Forest, Indian Reservation or State	Control Area		Worked Initially			Premaintenance Work Remaining		On Maintenance	
		Acres of White Pine	White Pine and Protection Zone	Acres of White Pine	Acres of Control Area	Percent of Control Area	Initial Work	Rework	Acres of Control Area	Percent of Control Area
NATIONAL FORESTS	Hoosier, Ind.	18	179	18	179	100.0	-	-	179	100.0
	Wayne, Ohio	515	4,029	515	4,029	100.0	-	-	4,029	100.0
	Huron, Mich.	10,959	22,441	10,474	21,316	95.0	1,125	12,582	8,734	38.9
	Manistee, Mich.	31,801	88,790	30,951	86,925	97.9	1,865	9,461	77,464	87.2
	Hiawatha, Mich.	15,609	41,159	15,609	41,159	100.0	-	7,013	34,146	83.0
	Marquette, Mich.	11,702	25,720	11,702	25,720	100.0	-	2,788	22,932	89.2
	Ottawa, Mich.	13,245	25,848	12,075	23,698	91.7	2,150	11,347	12,351	47.8
	Superior, Minn.	33,975	47,964	29,239	39,479	82.3	8,485	15,953	23,526	49.0
	Chippewa, Minn.	13,466	22,612	13,289	22,201	98.2	411	6,542	15,659	69.3
	Chequamegon, Wis.	33,943	56,657	32,417	53,884	95.1	2,773	14,502	39,382	65.5
	Nicolet, Wis.	13,183	25,646	13,183	25,646	100.0	-	6,068	19,578	76.3
	All National Forests	178,416	361,045	169,472	344,236	95.3	16,809	86,256	257,980	71.5
INDIAN RESERVATIONS	Sac Fox, Iowa	50	500	50	500	100.0	-	-	500	100.0
	Grand Portage, Minn.	1,097	1,496	1,097	1,496	100.0	-	1,496	-	0.0
	Leech Lake, Minn.	1,094	1,639	1,080	1,596	97.4	43	523	1,073	65.5
	Nett Lake, Minn.	4,908	7,087	4,908	7,087	100.0	-	841	6,246	88.1
	Vermilion, Minn.	78	186	78	188	100.0	-	-	186	100.0
	White Earth, Minn.	675	1,319	601	1,213	92.0	106	548	665	50.4
	Red Lake, Minn.	12,635	19,100	12,120	18,292	95.8	808	3,503	14,789	77.4
	Bad River, Wis.	8,547	15,023	8,451	14,846	98.8	177	1,327	13,519	90.0
	Lac Court Oreilles, Wis.	15,174	26,685	14,115	25,358	95.0	1,327	2,178	23,180	86.9
	Lac du Flambeau, Wis.	14,411	26,001	14,411	26,001	100.0	-	-	26,001	100.0
	Menominee, Wis.	25,375	42,412	24,642	40,977	96.6	1,435	10,635	30,342	71.5
	All Indian Reservations	84,044	141,448	81,553	137,552	97.2	3,896	21,051	116,501	82.4
NON-FEDERAL PUBLIC LAND	Illinois	1,672	7,761	1,670	7,663	98.7	98	5,187	2,476	31.9
	Indiana	3,169	18,209	3,057	17,322	95.1	887	1,599	15,723	86.3
	Iowa	627	3,818	627	3,818	100.0	-	1,892	1,926	50.4
	Michigan	161,855	347,735	144,633	319,754	91.9	27,981	136,817	182,937	52.6
	Minnesota	57,805	118,867	35,714	70,054	58.9	48,813	50,155	19,899	16.7
	Ohio	8,787	33,693	7,181	29,562	87.7	4,131	8,125	21,437	63.6
	Wisconsin	155,253	431,646	150,971	415,652	96.3	15,994	214,186	201,466	46.7
	All Non-Federal Public Land	389,168	961,729	343,853	863,825	89.8	97,904	417,961	445,864	46.4
PRIVATE LAND	Illinois	1,095	5,896	1,012	5,391	91.4	505	3,912	1,479	25.0
	Indiana	7,560	74,196	6,146	61,983	83.5	12,213	10,970	51,013	68.8
	Iowa	2,485	10,551	2,167	9,291	88.1	1,260	4,457	4,834	45.8
	Michigan	232,128	748,859	196,198	634,372	84.7	114,487	363,655	270,717	36.2
	Minnesota	106,329	309,259	74,051	217,988	70.4	91,291	166,592	51,376	16.6
	Ohio	13,414	97,974	11,772	92,773	94.7	5,201	9,882	82,891	84.6
	Wisconsin	290,324	1,078,639	248,378	895,341	83.0	183,298	379,470	515,871	47.8
	All Private Land	653,335	2,325,374	539,724	1,917,119	82.4	408,255	938,938	978,181	42.1
TOTAL STATE AND PRIVATE LAND		1,042,503	3,287,103	883,577	2,780,944	84.6	506,159	1,356,899	1,424,045	43.3
TOTAL NORTH CENTRAL REGION		1,304,963	3,789,596	1,134,602	3,262,732	86.1	526,864	1,464,206	1,798,526	47.5
STATUS OF CONTROL BY AREAS, STATES AND DISTRICTS										
AREA I	Iowa	3,162	14,869	2,844	13,609	91.5	1,260	6,349	7,260	48.8
	Northern Minnesota	210,539	429,757	153,066	294,946	68.6	134,811	178,775	116,171	27.0
	Southern Minnesota	21,523	99,772	19,111	84,626	84.8	15,146	67,378	17,248	17.3
	All Minnesota	232,062	529,529	172,177	379,572	71.7	149,957	246,153	133,419	25.2
	AREA TOTAL	235,224	544,398	175,021	393,181	72.2	151,217	252,502	140,679	25.8
AREA II	Illinois	2,767	13,657	2,682	13,054	95.6	603	9,099	3,955	28.9
	Eastern Wisconsin	214,593	703,958	194,305	619,467	88.0	84,491	260,959	358,508	50.9
	Western Wisconsin	341,617	998,751	312,263	878,238	87.9	120,513	367,407	510,831	51.1
	All Wisconsin	556,210	1,702,709	506,568	1,497,705	88.0	205,004	628,366	869,339	51.0
	AREA TOTAL	558,977	1,716,366	509,250	1,510,759	88.0	205,607	637,465	873,294	50.9
AREA III	Indiana	10,747	92,584	9,221	79,484	85.8	13,100	12,569	66,915	72.3
	Ohio	22,716	135,696	19,468	126,364	93.1	9,332	18,007	108,357	79.9
	Lower Michigan	328,210	960,391	287,668	844,305	87.9	116,086	437,268	407,037	42.4
	Upper Michigan	149,089	340,161	133,974	308,639	90.7	31,522	106,395	202,244	59.4
	All Michigan	477,299	1,300,552	421,642	1,152,944	88.7	147,608	543,663	609,281	46.8
	AREA TOTAL	510,762	1,528,832	450,331	1,358,792	88.9	170,040	574,239	784,553	51.3

TABLE 5

CURRENT AND CUMULATIVE CANKER PRUNING
NORTH CENTRAL REGION

FROM INCEPTION TO DECEMBER 31, 1958

State	Ownership Class	No. of Areas Treated	Number of Trees Examined	Number of Trees Removed	Number of Trees Treated	No. of Cankers Removed	Man-Days Used
			Calendar Year 1958				
Illinois	State	1	3,000	-	-	3	1
Iowa	State Park	8	7,800	7	9	10	6
Minnesota	State Hospital	1	1,408	387	643	1,109	20
Wisconsin	Natl. Forest	1	7,101	283	691	2,106	20
Region Totals		11	19,309	677	1,343	3,228	47
			Cumulative to December 31, 1958				
Illinois	All	1	3,000	-	-	3	1
Indiana	All	4	973	-	8	11	1
Iowa	All	99	87,392	1,233	1,192	2,608	134
Michigan	All	403	877,976	2,770	62,661	126,998	4,112
Minnesota	All	219	563,405	9,068	55,989	94,258	2,406
Ohio	All	5	1,306	13	44	126	15
Wisconsin	All	31	506,254	7,219	42,672	54,898	782
Region Totals		762	2,040,306	20,303	162,566	278,902	7,451

TABLE 6

NURSERY SANITATION PERFORMED
NORTH CENTRAL REGION 1958

Ownership and Name of Nursery	Working	White Pine Trees in Nursery (Thousands)	Acres Protected	Acres in Sanitation Zone	Ribes Destroyed	Man-Days Used
WISCONSIN						
Gordon (State)	15	883	40	373	1200	36
Hayward (State)	15	2,000	100	572	6469	50
Nepco Lake (Private)	4	1,000	30	220	15865	73
ILLINOIS						
Mason (State)	8	3,000	80	575	76	1
Total	42	6,883	250	1740	23610	160

TABLE 7

APPROXIMATE NUMBER OF MAN-MONTHS EMPLOYED
BY MONTHS, AGENCIES AND STATES
NORTH CENTRAL REGION - CAL. YEAR 1958

Agency	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Average per Month
ILLINOIS														
State & Private	1.0	1.0	1.0	5.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	16.0	1.3
IOWA														
State & Private	-	-	-	-	-	0.8	1.3	1.6	1.6	-	-	-	5.3	0.5
FS - 720	1.0	1.0	0.8	-	-	-	-	-	1.0	0.3	-	1.0	5.1	0.4
FS - 411	-	-	-	-	-	1.5	1.3	1.0	-	-	-	-	3.8	0.3
Total	1.0	1.0	0.8	-	-	2.3	2.6	2.6	2.6	0.3	-	1.0	14.2	1.2
MICHIGAN														
State & Private	2.0	1.8	1.8	1.8	23.8	41.9	43.5	45.5	21.5	1.8	1.5	1.5	188.4	15.7
FS - 720	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	30.0	2.5
FS - 411	1.0	1.0	1.0	1.2	10.9	7.5	8.0	8.0	4.1	1.2	1.0	1.0	45.9	3.8
National Forests	-	-	-	-	8.7	14.1	13.7	7.9	4.0	-	-	-	48.4	4.1
Total	5.5	5.3	5.3	5.5	45.9	66.0	67.7	63.9	32.1	5.5	5.0	5.0	312.7	26.1
MINNESOTA														
State & Private	-	-	-	4.5	19.5	16.2	20.5	13.7	0.3	-	-	-	74.7	6.2
FS - 720	3.0	3.0	3.0	3.0	3.0	2.8	1.0	1.0	1.0	1.0	2.0	2.0	25.8	2.2
FS - 411	1.0	1.0	1.0	1.5	3.9	7.4	9.3	7.5	5.0	3.6	1.0	1.0	43.2	3.6
National Forests	-	-	-	-	-	8.9	35.9	33.0	0.8	0.6	0.3	-	79.5	6.6
Bur. Ind. Affairs	-	-	-	-	14.1	6.0	-	6.0	0.3	-	-	-	26.4	2.2
Total	4.0	4.0	4.0	9.0	40.5	41.3	66.7	61.2	7.4	5.2	3.3	3.0	249.6	20.8
WISCONSIN														
State & Private	2.0	2.0	2.0	3.0	18.2	20.8	32.1	24.1	11.2	2.0	2.0	2.0	121.4	10.1
FS - 720	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	42.0	3.5
FS - 411	-	-	-	-	1.6	10.8	20.5	10.6	3.0	-	-	-	46.5	3.9
National Forests	-	-	-	3.0	6.0	10.0	20.0	18.0	10.0	2.0	1.0	-	70.0	5.8
Bur. Ind. Affairs	-	-	1.0	2.0	17.2	10.0	11.5	7.5	2.0	-	-	-	51.2	4.3
Total	5.5	5.5	6.5	11.5	46.5	55.1	87.6	63.7	29.7	7.5	6.5	5.5	331.1	27.6
REGIONAL OFFICE														
FS - 720 - F.P.C.	4.0	4.0	4.0	4.0	6.4	6.0	4.4	4.0	4.0	4.0	4.0	4.0	52.8	4.4
TOTAL REGION														
State & Private	5.0	4.8	4.8	14.3	62.5	80.7	98.4	85.9	35.6	4.8	4.5	4.5	405.8	33.8
FS - 720	14.0	14.0	13.8	13.0	15.4	14.8	11.4	11.0	12.0	11.3	12.0	13.0	155.7	13.0
FS - 411	2.0	2.0	2.0	2.7	16.4	27.2	39.1	27.1	12.1	4.8	2.0	2.0	139.4	11.6
National Forests	-	-	-	3.0	14.7	33.0	69.6	58.9	14.8	2.6	1.3	-	197.9	16.5
Bur. Ind. Affairs	-	-	1.0	2.0	31.3	16.0	11.5	13.5	2.3	-	-	-	77.6	6.5
GRAND TOTAL	21.0	20.8	21.6	35.0	140.3	171.7	230.0	196.4	76.8	23.5	19.8	19.5	976.4	81.4

TABLE 8

EXPENDITURES, NORTH CENTRAL REGION, CALENDAR YEAR 1958
BY STATE AND SOURCE OF FUNDS

Source of Funds	ILLINOIS	IOWA	MICHIGAN	MINNESOTA	WISCONSIN	REGIONAL OFFICE	TOTAL
State Indirect Aid							
January - June	$210	$480	$675	$1,750	$8,100	-	$11,215
July - December	210	480	675	1,750	8,100	-	11,215
State Direct Aid							
January - June	4,354	144	19,518	11,780	19,658	-	55,454
July - December	3,754	1,116	26,668	9,810	29,431	-	70,779
Sub-Total, State	8,528	2,220	47,536	25,090	65,289	-	148,663
Forest Service - 720							
January - June	433	1,590	11,752	15,348	17,410	$ 9,360	55,893
July - December	-	1,030	8,959	7,329	14,462	15,924	47,704
Forest Service - 411	-						
January - June	-	98	10,786	4,520	9,105	100	24,609
July - December	-	1,189	12,169	9,575	14,922	1,167	39,022
National Forests - 042							
January - June	-	-	6,790	6,727	3,486	110	17,113
July - December	-	-	5,957	30,169	11,806	4,130	52,062
Bur. Ind. Affairs							
January - June	-	-	-	8,064	11,351	-	19,415
July - December	-	-	-	2,861	4,669	-	7,530
Sub-Total, Federal	433	3,907	56,413	84,593	87,211	30,791	263,348
All Funds							
January - June	4,997	2,312	49,521	48,189	69,110	9,570	183,699
July - December	3,964	3,815	54,428	61,494	83,390	21,221	228,312
Region Total	8,961	6,127	103,949	109,683	152,500	30,791	412,011

TABLE 8 A
EXPENDITURES BY ACTIVITY AND STATE

State or Source of Funds	Program Planning Direction	Surveys and Checking	Ribes Eradication	Nursery Protection	Canker Pruning	Methods Studies	Educational Work	Total
Illinois	2,520	500	2,303	30	35	400	3,173	8,961
Iowa	1,880	600	2,847	300	300	-	200	6,127
Michigan	8,550	12,852	81,747	-	-	-	800	103,949
Minnesota	17,051	22,151	61,976	500	80	5,567	2,358	109,683
Wisconsin	8,500	10,104	115,685	1,945	216	14,650	1,400	152,500
Regional Office	27,791	-	-	-	-	2,000	1,000	30,791
Region Total	66,292	46,207	264,558	2,775	631	22,617	8,931	412,011

TABLE 8 B
EXPENDITURES BY ACTIVITY AND SOURCE OF FUNDS

State Indirect Aid	6,830	-	-	800	-	14,400	400	22,430
State Direct Aid	2,000	10,158	105,057	1,810	35	3,400	3,773	126,233
Forest Service - 720	48,476	14,006	32,361	30	320	4,204	4,200	103,597
Forest Service - 411	3,434	11,547	47,926	135	60	251	278	63,631
National Forests - 042	5,552	6,209	56,556	-	216	362	280	69,175
Bur. of Indian Affairs	-	4,287	22,658	-	-	-	-	26,945
Region Total	66,292	46,207	264,558	2,775	631	22,617	8,931	412,011
Percent Each Activity	16.1	11.2	64.2	0.6	0.2	5.5	2.2	100.0